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# *The Indian Forester*





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THE  
INDIAN FORESTER  
A MONTHLY MAGAZINE  
OF  
FORESTRY  
AGRICULTURE, SHIKAR & TRAVEL.

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COMMITTEE OF MANAGEMENT :

F. B. MANSON, CONSERVATOR OF FORESTS,  
R. McINTOSH, M.A., AND E. P. STEBBING, F.L.S., F.Z.S., F.E.S.  
DEPUTY CONSERVATORS.

---

EDITED BY

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### *Correction Slip.*

The November number of the Magazine was edited by Mr. R. McIntosh not by Mr. Stebbing as stated on the cover owing to an unwarranted alteration by the printer.

*Corrections and Errata* to the 'Notes on Sandal' published in the June, August and September numbers, 1904.

		For 'Congeners' read 'Associates' in every case.	
Page 249, line 28	For 'Alangium lamarkii' read 'Alangium lamarkii.'		
" 249, 34, "	Pandal [avarai olegu- minous climber grown in gardens.	"	Pandal avarai [a legu- minous climber grown in gardens.
" 251 against girth class 55°—57" }	"	†3	" {3
Footnote "	Permatuvely	"	Prematurely.
" 252, line 46, "	3900	"	3600.
" 256, footnote (c) "	pongamia	"	Pongamia.
" 257, line 35, "	made	"	make.
" 725, " 43, "	20" to 26"	"	20 to 26
" 257, " 44, "	9" to 13"	"	9 to 13.
" 261, " 11 in "	Zylopyra	"	xylopyra.
last col.			
" 265, " 5, " "	member	"	Number.
" 267, " 1, " "	purpose	"	propose
" 358, " 32, " "	shoot	"	shoot up.
" 359, " 19, omit	' it does so.'		
" 361, " 46, for	maruium.	"	marsepium
" 362, " 34, "	posts	"	hosts.
" 397, " 37, "	host	"	hosts
" 397, " 37, "	Question	"	questions
" 397, " 37, "	Condition	"	conditions.
" 398, " 43, "	the important	"	this important.
" 401, " 26, "	sacutia	"	scutia.
" 401, " 29, "	Limorias	"	Limonias.
" 401, " 30, "	Cudrainas	"	Cudranias.
" 401, " 31, "	Holoptebra	"	Holoptelea.
" 401, " 32, "	Coconut	"	Cocoanut.



# THE INDIAN FORESTER.

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[No. 1.

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## **Note on *Hyblæa puera*.**

BY R.S. HOLE, F.C.H., F.E.S.

1. "IN Part No. 2 of his *Departmental Notes on Insects that affect Forestry* Mr. Stebbing has given the life-history of *Hyblæa puera* so far as it is possible, with the observations which, up to date, have been recorded regarding it. The following note has been compiled from observations made by me in 1901, in the Jubbulpore district of the Central Provinces, and as it throws additional light on a few doubtful points, it will, I trust, prove interesting. The observations are unfortunately not complete; but as owing to my recent transfer it is improbable that I shall be able to supplement or correct them for some time to come, I venture to put them forward as they are.

### DESCRIPTION.

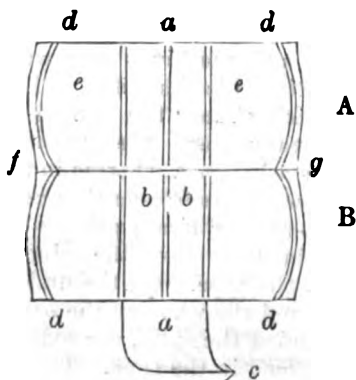
2. *Moth*.—The type is described on p. 371, Vol. II of *Hampson's Moths*, and no repetition of this description is needed here. It is, however, necessary to note that the colouring and markings vary considerably in different specimens, and in many cases depart widely from those of the type. From a number of moths collected by me I selected eleven which showed the most striking departures from the characters of the type, and sent them to Mr. de Nicéville for opinion, pointing out that in several cases the colouring and markings approached those of *Hyblæa constellata*. Mr. de Nicéville identified all these specimens as *Hyblæa puera*, remarking that "the species is obviously a very variable one." In many cases the ground colour of the thorax and forewing above is ashy grey, whereas in the type it is greyish red-brown. The forewing has frequently more or less extensive greenish or yellowish-white diffused patches on the upper side, which are triangular in shape when the wings are closed. These patches are absent in the type. On the under side, the costa and apex of the forewing and the whole of the hind wing, as well as the abdomen below and at the sides, are sometimes suffused with crimson. This is not seen in the type. The normal wing expanse is from 1·26 to 1·57 inches, but abnormally small specimens are

occasionally met with, the larvæ, apparently, having pupated before reaching their full development. One such seen by me had a wing expanse of only 1.02 inches.

3. *Pupa*.—Stout; colour bright brown to very dark purplish brown or black, with a few light scattered bristles. Short obtuse tail, furnished at the extremity with a hook, like a minute grapnel, with several flukes or claws. Length and mid-diameter of pupa in inches 0.74 and 0.21 respectively.

4. *Larva*.—On leaving the egg the larva is pale reddish or greenish-yellow in colour, with a black head and dorsal black mark on the first somite. It is then  $\frac{1}{4}$  of an inch long and is active from the first. The colour of the dorsal surface gradually darkens and becomes greyish-green, the under surface being paler, the head and dorsal band on the first somite being jet black. When about a week old a change of skin takes place, after which the appearance of the larva entirely changes, the colouring being now practically that of the mature larva, which remains but little changed until the end of the larval existence. The general colour is now dark purple-grey to black above and bright yellow to greyish-green below. In *Hampson's Moths* the larva taken as the type is described as follows: "With a few short hairs; dark purple-grey above, olive-green below, with dorsal and lateral white lines; a sub-dorsal series of minute white dots and rings, a series of black dots on lateral line; head and first somite black."

Just as in the case of the moth so in the case of the larva, the colouring of different specimens varies greatly, and the principal variations are, in the case of the larva, found on the dorsal surface. In the larva which Hampson has apparently adopted as the type, a narrow pale and indistinct line will usually be found running along the middle of the back. On each side of this central line there is a clear white dorsal line, and below each of these dorsal lines there is a clear white lateral line running along each side of the larva just above the junction of the upper grey and lower yellow colour.



The above is a rough diagram of two adjacent segments of the larva seen from above, and enlarged, indicating the positions occupied by these various lines :—

- (a) is the central dorsal line, which is very faint in the type,
- (cc) the dorsal white lines,
- (dd) the lateral white lines,
- (bb) the spaces between the central and side dorsal lines,
- (ee) that portion of the sides of the larva lying between the dorsal white lines cc and the lateral lines dd,
- (fg) the junction line between the adjacent segments A and B.

5. The central line (a), instead of being pale grey or smoky coloured, as it usually is in the type, is often orange or flesh-coloured, the spaces (bb) being still well marked and as dark in colour as the upper part of the sides (ee). In other specimens this flesh-coloured line is seen to get gradually wider, until, finally, in some larvæ it will be seen to occupy the whole of the space covered by the central line (a) and the adjoining spaces (bb), the flesh or orange colour then extending over the middle of the dorsal surface as far as the white lines (cc) on either side.

6. The spaces (bb) may be as dark as the upper part of the sides (ee), or they may be considerably paler, and their colour spreads, transversely, along the junction line (fg), between two adjacent segments, thus more or less interrupting the lines (a) and (c). When the orange line extends over (a) and (bb) the central portion (a) is sometimes lighter than the remainder of this space.

7. All the colours become pale shortly before pupation, and it is often difficult to determine how far the normal colouring has been modified by this approaching change.

8. I have by no means indicated all the variations of colour which may occur, but the above appear to be the most important, and I wish to emphasize the fact that there appears to be a complete series of intermediate forms, uniting the dark larva, in which the central dorsal line is scarcely, if at all, distinguishable and not orange coloured, with the larva in which the orange or flesh-coloured line occupies the whole of the dorsal surface between the dorsal white line cc.

9. The larva is shy and seldom exposes its whole body to view voluntarily. It constructs for itself, among the leaves on which it feeds, a shelter in which it lies during the day and in the neighbourhood of which it feeds at night. Consequently it is somewhat difficult to measure it, for if measured when at rest, crouching in its shelter, the measurements are too small, while it moves so quickly if disturbed that it is difficult to measure it when extended to its true length. Several measurements of the mature larva made by me showed its average length to be 1.26 inches and its mid-diameter 0.22 inches. The larva tapers to both ends.

10. *Eggs*—Are striate, yellowish or greenish in colour, oblong with long diameter 0·05 inch; are somewhat transparent, and the black head of the young larva can be distinctly seen inside the egg shortly before hatching. After hatching the empty egg shells are colourless. They are laid singly, usually on the back of the young leaves and generally in an angle between two veins, or where the lateral veins join the mid-rib. The youngest leaves are usually selected for egg-laying, so that the young larvæ may have plenty of soft leaf tissue near at hand when they emerge from the eggs.

11. The above description has been given in considerable detail, especially for the moth and larva, chiefly for two reasons, which are :—

(1) The imago is very variable, and in several cases the colouring and markings resemble those of *Hyblæa constellata*. The latter has recently been reported as attacking teak trees in Burma in company with *Hyblæa puera*. It is therefore possible that these insects may be confused, and in recording observations with the object of completing their life-histories, it is most important to make sure of the identification in each case. It should be remembered that *Hyblæa constellata* is separated from *Hyblæa puera* by two principal characters, which appear to be constant and are as follows :—

(a) *H. constellata* has the outer margin of the forewing excised below the apex and excurved at the centre, whereas in *H. puera* the margin is evenly curved and not excised.

(b) In *H. constellata*, in the anal angle, on the under side of the hind wing, there is a single black spot, whereas in *H. puera* there are two such spots.

(2) Mr. Stebbing has recently separated a variety of *H. puera*, which he has provisionally named *H. nigra*, the principal character relied on to distinguish the variety being the dark colour of the dorsal surface of the larva and the absence of any flesh-coloured dorsal line. I have shown, in the larval description given above, that there exists a complete series of intermediate forms, uniting the dark-coloured larva, which has no flesh-coloured dorsal stripe, with the larva in which this stripe covers the whole of the dorsal surface between the dorsal white lines. With such a variable insect I cannot but think it will ultimately prove impossible to regard *H. nigra* as a distinct or well-marked variety, and that therefore it is inadvisable to attempt to classify it separately, at all events in the present state of our knowledge.

#### LIFE-HISTORY.

12. *Food plant of larva*.—Hampson gives *Bignoniaceæ* as the food plant. During the rains of 1901 in Jubbulpore the insect was not very numerous, and although I searched carefully and repeatedly, I could only find the larvæ on *Millingtonia hortensis*, with the exception of two isolated individuals seen on teak on August 15th. I made several attempts to make larvæ





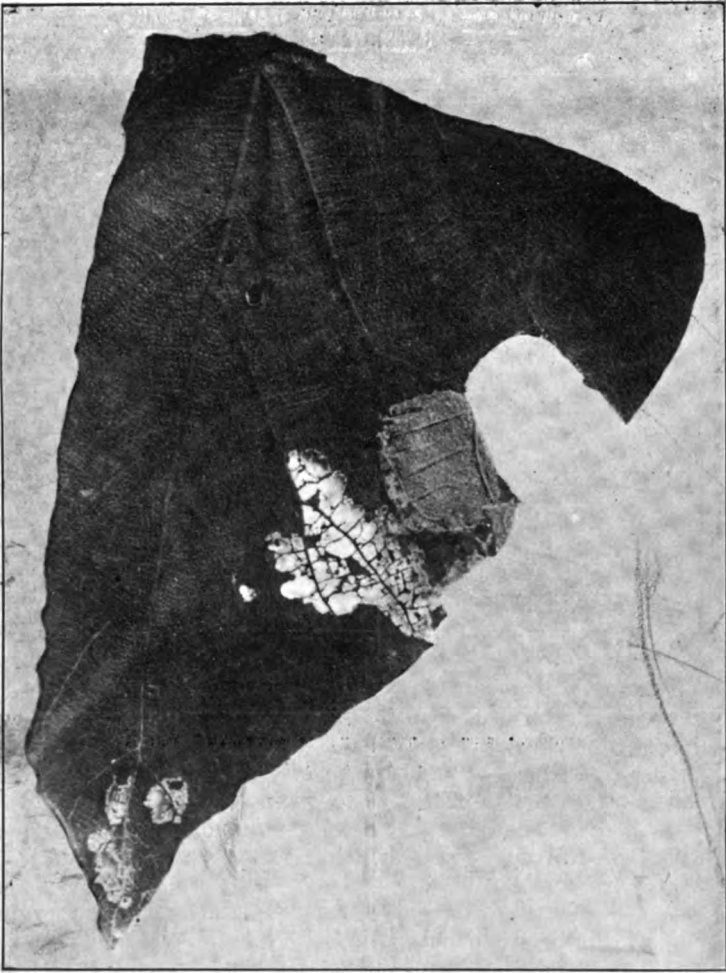


FIG. I.  
LARVAL SHELTER CONSTRUCTED ON A TEAK LEAF by  
*Hyblaea Pueri*.

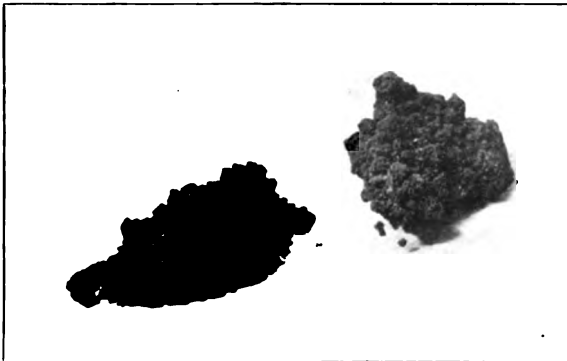


Fig. III.  
PUPAL CHAMBERS CONSTRUCTED IN THE GROUND by  
*Hyblaea Pueri*.

bred on *Millingtonia* leaves eat teak leaves, but was not successful. If able to escape, the larvæ at once left the teak leaves to search for other food; if unable to escape and kept from other food, they died, or in some cases, if nearly mature, pupated. Very little, if any, of the teak leaves, however, was eaten in any case. Only one larva was induced to eat an appreciable amount, which I obtained from the leaves of a *Millingtonia* tree on 19th September and which lived on a teak leaf for 11 days, dying on September 30th after a change of skin. This larva constructed a shelter by cutting and turning over a flap on the edge of the leaf, which, together with the portion of leaf eaten by the larva close to the shelter, is shown in Fig. I. When fed on *Millingtonia* leaves I found that several larvæ attained their full development and pupated in 10 days, whereas this larva, fed on teak, although more than 11 days old, was then scarcely half-grown, and the photograph shows that it had only just acquired the power of biting through the fine veins of the leaf. In this case it was clear that the larvæ preferred the leaves of *Millingtonia hortensis* to those of teak, and it is probable that other plants belonging to the Order *Bignoniaceæ* are preferred to teak when they are available. It is also obvious that, in this case, the larvæ did not readily adapt themselves to the teak diet, and that many perished through their inability to do so. It therefore appears that the development of the larvæ can be considerably checked by destroying the supply of their favourite food, and this also indicates the enormous numbers in which the larvæ must exist in years when they are able to completely defoliate trees so dissimilar as teak and *Albizia lebbek*, which happened in Jubhulpore in July 1900, as noted on p. 427 of the *Forester* for August 1901.

#### HABITS OF THE LARVÆ.

13. The larvæ, when disturbed, let themselves down by threads from the tree on which they are feeding, sometimes directly to the ground and sometimes remaining suspended for some time in the air, after which they pull themselves back again on to the leaves above. The larvæ acquire this power of letting themselves down by threads almost immediately after leaving the egg.

14. When irritated, the larva emits a dark green fluid, which it ejects from its mouth to a considerable distance.

15. As has been noticed above, the larva is shy and seldom exposes its whole body to view, always constructing hiding places for itself on the leaves on which it feeds. On leaving the egg the larva at first feeds on the soft tissue of the young leaves, but it soon is able to bite through the smaller veins, and it then cuts a small flap out of the edge of the leaf, which it pulls over and fastens to the upper leaf surface, thus forming a small shelter, inside which it lies, under the folded or curled leaf edge. As the larva grows the shelter is made larger to accommodate it. In the case of *Millingtonia hortensis* a single leaflet soon becomes too small to hold the larva, and several leaflets are then fastened

together to form the shelter. Fig. II, *a* and *b*, shows the front and back view respectively of the shelter of a large larva made on a piece of a *Millingtonia* leaf. I have unfortunately obtained no good example of the shelter made by a mature larva on a teak leaf, but I believe they are almost always constructed by rolling over a portion of the leaf edge.

16. The larva eventually destroys the whole of the green tissue of the leaf attacked, leaving only the main ribs with small portions of uneaten green tissue adhering to them here and there.

17. The larva does most of its feeding at night, but even when feeding, it usually keeps part of its body inside the shelter, into which it hastily retreats on being alarmed.

18. It is perhaps as well to draw attention here to the fact that *Pyrausta macheralis*, which is so often found attacking teak in company with *Hyblæa puera*, has been called the "Teak-leaf roller." This would appear to be a misnomer, and is due, I believe, to a confusion of *Pyrausta* with *Hyblæa*. The larvæ of *Pyrausta* when feeding on teak leaves do not, as a rule, roll up the edge of the leaves, but lie on the surface of the leaf, below a light web of silk threads, whereas this rolling of the leaf-edge is very characteristic of the *Hyblæa* larva when feeding. Again, the larva of *Pyrausta* usually takes advantage of the most convenient cavity or depression available within which to pupate. In the case of damaged, dead and withered leaves the naturally curled up edge forms such a cavity, but here the rolling is not caused by the insect. When the larva pupates on green leaves, where naturally curled-in edges are rare, pupation in the rolled up edge is quite the exception, the larva usually taking up its position in a depression along the midrib, or lateral vein, and there forms its cocoon, drawing the sides of the leaf loosely together over it with a silky web, the cocoon being made to fit the cavity. The *Hyblæa* larva, on the other hand, when it pupates, as it sometimes does, on the leaves on which it has been feeding, constructs the pupal chamber in exactly the same way as its larval shelter on the same kind of leaf, all openings of course being closed. On teak leaves therefore pupation would take place in the rolled up end or edge of the leaf. Further, it appears probable that when larvæ of both *Pyrausta* and *Hyblæa* are feeding on the same trees, as is often the case with teak, the larvæ of *Pyrausta* will often utilize, as convenient places for pupation, the larval shelters made by the *Hyblæa* larvæ and vacated by them. Anyone casually observing the larvæ or pupæ of *Pyrausta* in these shelters, under the curled up leaf edge, would be apt to conclude that the rolling was done entirely by *Pyrausta*, whereas in reality the *Hyblæa* larva is responsible for it.

19. Seeing that this leaf rolling appears to be the exception and not the rule in the case of *Pyrausta*, I consider the term "leaf-roller" to be a misnomer, which is apt to give an incorrect impression of the habits of the larva.



FIG. IIa.  
FRONT VIEW OF LARGE LARVAL SHELTER MADE  
ON A LEAF OF *Millingtonia hortensis* by  
*Hyblaea Pueri*.



FIG. IIb.  
BACK VIEW OF LARGE LARVAL SHELTER MADE ON A  
LEAF OF *Millingtonia hortensis* by  
*Hyblaea Pueri*.



20. Mr. Cubitt, in an interesting case of defoliation of teak by *Hyblæa pueræ*, recorded on p. 422 of the *Forester* for August 1901, Vol. XXVII, notes that only the tallest trees were attacked. This appears to be unusual, for on trees exposed to light on all sides, and which are consequently branched close to the ground, I have found that the larvæ do not by any means spare the lower branches, and that, if anything, the lower branches suffered most severely in the cases noticed by me. This, after all, was only natural, for the moths emerged from the pupal chambers, situated as a rule low down near the ground, and finding suitable young leaves for egg laying on the lower branches of the trees near them, laid their eggs there without troubling to fly to the highest twigs. As has been already noticed, however, the moth prefers to lay its eggs on the *youngest* leaves, and in the high teak forest seen by Mr. Cubitt the largest supply of soft young leaves would have been on the upper branches of the tallest teak trees, which alone were probably exposed freely to light on all sides, and the majority of the eggs would consequently have been laid on them.

#### MODE OF PUPATION.

21. Pupation may take place—

- (a) In the leaves of the tree on which the larva is feeding.
- (b) In the leaves of shrubs or herbs growing beneath the trees attacked by the larva.
- (c) In dead leaves lying on the ground.
- (d) In the soil.

As a rule the larvæ, when mature, quit the leaves on which they have been feeding and pupate in the leaves of the undergrowth below, or, in the absence of suitable undergrowth, in the dead leaves lying on the ground, and in the soil. At the same time pupæ are occasionally found in dead leaves lying on the ground beneath a thick undergrowth of shrubs, although the number of such pupæ is usually small compared with the number of pupæ lying among the green leaves of these shrubs themselves growing beneath the attacked trees.

22. The larvæ not rarely pupate on the leaves on which they have been feeding, even though there may be undergrowth below the trees and dead leaves on the ground beneath. In this case, if feeding at some height above the ground, they usually leave the higher branches and pupate on the leaves of the lower branches. Occasionally, however, the larva remains in its shelter near which it has been feeding, and pupates there.

23. From experiments made by me it appears that, when the leaves on which the larva feeds are close to the ground, there being no undergrowth, an unusually large proportion of larvæ pupate on the leaves of the attacked plants, and this is still more marked when there are no dead leaves on the ground below. This accounts for the interesting case recorded by Mr. L. S. Osmaaston on p. 516 of the *Forester* for 1900, Vol. XXVI, in which the larvæ, which had been attacking young teak transplants in a

nursery, pupated in large numbers in the rolled up ends or edges of the teak leaves. Mr. Osmaston kindly informed me that the young transplants attacked were only 6 inches high, that there was no undergrowth of herbs, teak being thickly planted over a clean prepared bed, and that there were no dead leaves on the ground.

24. Pupation may thus take place in several situations, and the pupal chamber constructed by the larva exhibits great variety in shape and mode of construction. In dead leaves, depressions and hollows, caused by the drying of the leaves, usually exist, which, with a little manipulation on the part of the larva, form suitable pupal chambers. Green leaves on the contrary usually possess few, if any, of such convenient hollows. Again, green leaves have to be treated differently according to their texture; coriaceous leaves cannot be folded so easily as soft, flexible leaves and so on.

25. When pupation takes place on the leaves, the pupal chamber is usually constructed in one of the following ways:—

(a) The tip of the leaf is pulled down and the leaf folded transversely to its length, the cocoon being made inside the fold.

(b) A flap is cut out of the edge of the leaf and folded or rolled over.

(c) The leaf is rolled up longitudinally, the cocoon being placed inside the roll. With a large leaf only a portion of the margin may be thus rolled; with a smaller leaf the whole of one-half may be rolled in, or finally the whole leaf may be rolled inwards from each side towards the midrib.

To make the chamber quite secure the hollow end of the roll is sometimes closed by having the surface of another leaf fastened tightly over it.

(d) The surfaces of two leaves which overlap one another are joined together, pupation taking place between them.

(e) Several small leaves are tightly bound together in a variety of ways, the cocoon being made inside them.

26. It has been noticed above that when pupation takes place on the leaves of the species attacked by the larva, the pupal chamber is constructed similarly to the larval shelters, all openings of course being closed in the case of the pupal chamber.

27. When pupation takes place in the soil, the pupal chamber is formed of silk and bits of earth bound together. Fig. III shows two such chambers.

#### TIME REQUIRED FOR A COMPLETE GENERATION.

23. The average period required for a complete generation of the insect, as noted in the case of the generations bred by me at Jubbulpore, from August to December 1901, was as follows:—

					Days.
From pairing of moths to emergence of larvæ from the eggs laid by the moths	..	..	..	..	7
Larval stage	..	..	..	..	13
Pupal do.	..	..	..	..	9
Total					29

The average time for a generation is therefore practically one month.

It must be understood that the period here given refers to cases in which the larvæ were fed on the leaves of *Millingtonia hortensis*, and it is possible that the larvæ require a longer period for development when fed on teak leaves.

29. The eggs usually hatch in three to four days.

30. In the few cases for which I was able to obtain accurate dates, the moths lived from 7 to 9 days. Egg-laying continues for a period of several days, the first larvæ of each generation appearing some time before the later larvæ of the same brood. The generations thus overlap, and all stages of the insect may be found at one and the same time. As a rule, this overlapping is not so marked as in the case of *Pyrausta machæralis*, probably owing to the fact that the latter is usually far more numerous than this species.

#### NUMBER OF GENERATIONS IN THE YEAR.

31. In 1901, in Jubbulpore, one generation of the insect succeeded another without intermission from August to December, four generations being passed through in this period, and there was probably at least one generation before this in July.

The most severe attack by this insect as yet seen by me occurred in Jubbulpore in July 1900.

32. In the Central Provinces the larva, I believe, usually appears first in June-July, and leaves the trees towards the end of November.

#### HIBERNATION.

33. Hibernation appears to commence towards the end of November, but unfortunately I was unable to fix the date accurately, or to discover where and in what stage the insect hibernates. It is probable that it hibernates in the soil in the larval stage, but this requires confirmation.

#### RELATIONS TO THE FOREST.

34. It has been shown above that the natural food plant of the larva does not appear to be teak, plants belonging to the order *Bignoniaceæ* being preferred; also that the larvæ find some difficulty in adapting themselves to a teak-leaf diet, and that the larval development, at all events at first, if not later, is slower on teak leaves than, for example, on the leaves of *Millingtonia hortensis*. Generally speaking, then, mixed forests containing a large proportion of plants belonging to *Bignoniaceæ* would be more favourable to the development of the insect than pure teak forests would be, and, in the former, a certain number of the larvæ would be kept alive on the food which suits them best, in years which are unfavourable to the development of the insect on a large scale.

35. Of course in years when the insect is present in large numbers and the favourite larval food runs short in consequence, teak, in common with several other species, is attacked, and once



the insect gets established in a pure teak forest, the number of teak which suffer will of course be far greater than would be the case in a mixed forest.

36. It is interesting to note that in the case recorded by Mr. Osmaston referred to above, the nursery was a new one, the teak plants being the first ever raised there, and there were no teak trees within several miles. In this case it is probable that the larvæ had been living in the neighbourhood on the leaves of other species, and the supply of these running short had driven the insect to attack the teak.

#### ENEMIES.

37. The larva is a voracious feeder, but fortunately for the forest it has many and powerful enemies. It is very liable to a fungoid disease. The larva is usually attacked, but I have also found pupæ killed by it. The diseased larvæ and pupæ become discoloured, wet and flabby, and are filled with a yellowish brown liquid.

38. The larvæ are very susceptible to injury just before moulting, or pupating, and great care must be taken not to handle them then.

39. The larvæ and pupæ, the latter especially, are greedily eaten by birds, which pull open the larval shelters and pupal chambers to gain their contents. In Jubbulpore, in 1901, crows were particularly destructive.

40. Spiders occasionally eat the larvæ.

#### PROTECTION AND REMEDIES.

41. The following suggestions are made, of course, on the understanding that the circumstances of each particular case will determine to what extent other considerations, such as the necessity of curtailing expenditure or sylvicultural requirements, will allow of the adoption of any of the proposed measures.

(a) All trees and plants which are valueless from a forest point of view, and the leaves of which are a favourite larval food, should be cut out and destroyed as far as possible.

(b) Enemies, and particularly birds, must be protected.

(c) Undergrowth below the trees attacked should be cleared, if this can be done without damaging the forest, and dead leaves allowed to accumulate on the ground. A large number of larvæ would then pupate in the dead leaves and in the soil, and if pigs are allowed in the forest during the larval attacks, they would destroy a considerable proportion of the larvæ and pupæ.

(d) Nurseries should be kept clear of all weeds and dead leaves from April to December. The majority of the larvæ will then pupate on the plants, and both larvæ and pupæ can be then easily collected by hand.

### The Training of Indian Forest Officers.

BY W. R. FISHER, B.A.

COLONEL PEARSON'S services to the Indian Forest Department in India and at Nancy are so great, that I am loath to differ in any way from the opinions he has expressed in the October number of the *Indian Forester*. There are, however, two points in which I consider his proposals unsound, and these are, as to the use of athletics for Forest students, and the selection of Edinburgh as the future training place for Indian Forest students.

The arguments which Colonel Pearson urges against training candidates for the Imperial staff of the Forest Service at Dehra Dun are conclusive. The excellent Forest School at Dehra Dun is already too small for the training of the Provincial staff of the Indian State forests as well as of the forest staff required by Native States. Three-quarters of the work there is done in the forest, and it is impossible to conduct this work satisfactorily with a large number of forest students, while the forests of Northern India differ materially from the tropical forests of Southern India. A second school, therefore, on the same lines as that of Dehra Dun, is required for the Forest staff of Madras, Bombay, Coorg, Mysore and other Native States of Southern India, to say nothing of Burma, for which an elementary forest school has already been established.

A reversion to the former Continental training of our Forest students is inexpedient for the reasons given by Colonel Pearson, and also because a much wider view of forestry is taken in the course introduced by Dr. Schlich into Cooper's Hill than in any other European forest school. French and German forest schools deal chiefly with the system of forestry practised by the State to which they are attached, and Continental forest students, therefore, do not gain a sufficiently broad view of forestry for Indian work. It is essential that our Indian Forest students should be taught forestry in Britain, by experienced Indian Forest Officers.

In case, therefore, the splendid foundation of Cooper's Hill should be abolished, Indian Forest students should, as Colonel Pearson suggests, be attached to a British University for a two years' course, followed by practical training on the Continent for one year.

Colonel Pearson, however, suggests Edinburgh University, preferring it to Oxford or Cambridge on the ground that 'many English University students waste their time at athletics, whilst the Edinburgh students are hardworking and conscientious workers.' It is well known that many students come to Edinburgh as mere boys and complete their course there at the ages of 19 or 20, when men usually come into residence at Cambridge and Oxford, and which is the age of our Indian Forest candidates. Many of the best Scotch students, also, after taking a Scotch University degree, come to Oxford or Cambridge to continue their studies

and such students would not be too old to compete with others in the Entrance examination for the Indian Forest Service, as some of them have already done.

As regards devotion to athletics, I had the privilege of studying at Cambridge, St. Andrews, and Edinburgh, and found that athletics are as keenly followed in the northern as in the southern Universities. I took an active part in athletics at all three Universities and did not find my work suffer from so doing. Boating and football do not take up much time, and are forms of exercise admirable for young men, who sometimes employ their spare time in less profitable pursuits. Experience at Cooper's Hill has shown that many of the best of our men have been good athletes as well as high up in the Class Lists.

Colonel Pearson has often conducted the candidates for the Indian Forest Service in the stiff twenty-five miles walk, which, up to this year, has been an essential part of their qualifying examination. This walk has now apparently been discontinued by the India Office, though, largely owing to the consequent disqualification of feeble persons, it has afforded a physically fine body of men to the Indian Forest Department. I am sure that no one recognizes more fully than Colonel Pearson that *mens sana in corpore sano* is a necessity for Indian Forest Officers, and this can be secured only by persistence in active physical exercise. If, moreover, our men are trained at Cambridge, it will appear further on that many afternoons usually would be necessarily occupied by field-work, as is at present the case at Cooper's Hill.

Apart from the question of age—and it is highly inexpedient that our students should go to India till they have become mature men—the chief reasons in favour of Cambridge are as follows:—

There is an admirable agricultural class at Cambridge, the syllabus for which I will proceed to give.

There are in the neighbourhood of Cambridge well-managed and extensive woodlands such as are non-existent near Edinburgh.

The list of lectures issued by the Board of Agricultural Studies at Cambridge comprises agriculture, chemistry, botany, geology, agricultural chemistry, engineering, mechanics and heat, fungoid diseases of plants, economic entomology, book-keeping, mensuration and surveying. Were a Professor of Forestry appointed—which would be at once done, if the India Office were to transfer the Forest students to Cambridge from Cooper's Hill,—forestry would take the place of agriculture in this class for Forest students, all the necessary instruction in auxiliary subjects being already available. The presence of Dr. Ward ensures that the botanical instruction is suitable for Forest students and of the highest class.

As the lectures are all given in the forenoon, several afternoons a week are available for practical instruction in forestry and surveying, and for botanical and geological excursions.

The woodlands belonging to the Duke of Bedford are extensive, and are managed under a working-plan prepared some years ago by Dr. Schlich; through the kindness of the Duke they would be available for field-work in forestry. They consist of oak, beech and other hard-woods, also of pine-woods and other conifers and are only one hour's distance from Cambridge by rail.

Although the University of Oxford has not at present an agricultural class, they would certainly establish one were the India Office inclined to send Forest students there. Oxford is better situated than Edinburgh as regards woodlands, and close to Oxford are the extensive beechwoods of the Chiltern Hills, while the Forest of Dean and High Meadow Woods, for which the late Mr. H. C. Hill made a working-plan in 1897, are easily accessible from Oxford by train.

### Notes on Sandal.

#### 1.—ROOT PARASITISM.

In 1896 I made a note to the effect that I did not believe in the root parasitism of sandal. After a series of observations on the point, the only thing that I could discover were some small white tuber-like growths attached to the rootlets of small seedlings. The observations of Messrs. McCarthy and Barber were more carefully made and have given rise to further investigation. In the September number of the *Indian Forester* there is an excellent article by Mr. M. Rama Rao on the subject. He has pointed out that root parasitism is the rule in the Salem district. The same is the case in North Coimbatore, if one can judge from a series of observations made at Hassanur. This locality is specially suited to such observation, being rich in sandal. The trees are, on the whole, particularly healthy and give a large percentage of scented wood of excellent quality.

The first plant put under observation was a healthy 4-year old plant growing in a dense thicket. It was carefully dug out and the attached mud washed away. No signs of attachment were found, except some minute tubers similar to those noticed in 1896. The whole root system was extracted from the dense mass of surrounding roots. Root fibres and root hairs were found in considerable numbers, and there is no doubt that the plant was living quite independently and had no inclination to attach itself to any of the surrounding roots. This, however, was not the case with subsequent observations.

Starting with small seedlings of a year old, distinct attachments by means of the small white tuber-like growths were found in every case. Seedlings up to six years old were examined and the haustoria became more and more marked, being larger in size and of a reddish-brown colour similar to the root. In one case no less than eight attachments were found, besides previous attachments, not so much in the form of scars as of haustoria themselves

attached to the host, but detached from the sandal plant. Several instances were also found of haustoria, still attached to the sandal plant, which had evidently finished their work. In most of these cases the principal roots, to which the haustoria were attached, belonged to *Premna tomentosa*.

Finally, a considerable-sized tree, between 10 and 15 years old, was examined in the same manner, the root being extracted with much difficulty.

In this tree the attachments were very numerous, but the most striking were three distinct large haustoria about the size of a four-anna piece. The host in this case was *Zizyphus xylopyra*. Other roots attacked were *Premna tomentosa* and a species of *Grewia*. My observations, that the root hairs and fibres decreased proportionately with the attachment, were similar to those of Mr. Rama Rao. Especially in the large tree, though the root system was well developed, much of it was, so to speak, ineffective, and I have little doubt that the nourishment was taken up chiefly through the haustoria.

## 2.—CONGENERS.

A list of congeners is given by Mr. Rama Rao in the article referred to above. It might be very considerably added to as far as this district is concerned. In fact there is hardly a tree growing between 2,000 and 4,000 feet altitude with which I have not seen it associated. *Vitex alata* and *pubescens* are common in sandal areas, whilst two species of *Carissa* and *Zizyphus anoplia* are specially noticeable as forming the scrub in which it is most generally found. I should certainly put asterisks against *Terminalia chebula*, *Premna tomentosa*, *Zizyphus xylopyra*, and *Acacia sundra*. On the other hand I should not include *Litsea zeylanica* or *Albizia umra* in the list of congeners, though it is found with the latter at low elevations.

## 3.—GIRTH CLASSES AND WEIGHT OF SCENTED WOOD.

Some useful figures on this point have now been collected, and a few may be given for comparison with other districts.

(1) *Mavihalla Coupe*. Altitude about 4,000 feet.

Very few trees under 12" girth gave any scented wood. In the few cases where scented wood was found, the average weight was only 183 tolas\*

Girth class.	Number of trees.		Average weight of scented wood (including root).	
			M. T.	
12"—15"	..	19	..	0.322
16"—18"	..	38	..	0.488
19"—21"	..	33	..	0.780
22"—24"	..	18	..	1.640
25"—30"	..	17	..	2.599
31"—36"	..	46	..	5.270
Above 36"	..	21	..	8.037

\* Note —1 maund = 1,000 tolas = 25 lbs.

(2) *Kotadui Coupe. Altitude about 4,000 feet.*

Girth class.					Average weight of scented wood (including trees without scented wood).	
					M	T.
Under 12"	..	..	25	..	..	0.068
12"—15"	..	..	25	..	..	0.371
16"—18"	..	..	25	..	..	0.680
19"—21"	..	..	25	..	..	1.488
22"—24"	..	..	25	..	..	2.774
25"—30"	..	..	25	..	..	4.118
31"—36"	..	..	25	..	..	7.180
Above 36"	..	..	25	..	..	11.852

(3) *Talakurai Coupe. Altitude about 3,000 feet.*

Girth class.						Average weight of scented wood (including root).	
						M	T.
6"—9"	..	..	165	..	..	0.200	
10"—12"	..	..	283	..	..	0.340	
13"—15"	..	..	357	..	..	0.600	
16"—18"	..	..	293	..	..	0.880	
19"—21"	..	..	163	..	..	1.333	
22"—24"	..	..	76	..	..	1.693	
25"—30"	..	..	83	..	..	2.500	
31"—36"	..	..	20	..	..	4.700	
Above 36"	..	..	5	..	..	5.000	

(4) *Karlia Coupe. Altitude about 2,300 feet.*

Girth class.						Average weight of scented wood (including root).	
						M	T.
6"—9"	..	..	39	..	..	0.385	
10"—12"	..	..	180	..	..	0.463	
13"—15"	..	..	304	..	..	0.787	
16"—18"	..	..	141	..	..	1.049	
19"—21"	..	..	63	..	..	1.613	
22"—24"	..	..	56	..	..	2.016	
25"—30"	..	..	26	..	..	1.579	
31"—36"	..	..	14	..	..	4.658	
Above 36"	..	..	..	..	..	Nil.	

(5) *Kodumpalli Coupe. Altitude about 2,300 feet.*

Girth class.						Average weight of scented wood (including root).	
						M	T.
9"—12"	..	..	19	..	..	0.560	
13"—15"	..	..	26	..	..	0.800	
16"—18"	..	..	23	..	..	1.560	
19"—21"	..	..	24	..	..	1.600	
22"—24"	..	..	12	..	..	2.500	
25"—30"	..	..	13	..	..	3.270	
31"—36"	..	..	9	..	..	6.600	
Above 36"	..	..	2	..	..	9.490	

The Mavihalla and Kotadai coupes adjoin and are at the same elevation, yet the difference of outturn is very marked. The

Karlia and Kodampalli coupes are at the same elevation but on different plateaux, over 20 miles apart. The difference of outturn is most marked.

Speaking generally, scented wood appears to form more quickly at lower elevations, but to increase less as the girth of the tree becomes bigger. Trees of large size are far more numerous at the higher elevations, which seems to point to a more advanced age of maturity.

Kodampalli has a particularly good outturn, but other coupes in the same locality show that it is by no means exceptional. Figures of this sort may give rise to much conjecture, but in my opinion only prove the immense variation of sandal even when grown under similar conditions.

#### 4.—THE VALUE OF SANDAL LAND.

I have never seen any attempt made to value sandal land. Such valuations are very difficult on account of the patchy nature of the growth. In spite of these difficulties a few observations on the head may not be out of place.

In this district there are not a few acres which contain at least 200 visible sandal trees to the acre. I have recently seen many such on the Talamalai plateau, and will therefore apply the figures taken from the Kodampalli coupe on that plateau. Supposing that, in the next 40 years, we worked out these trees at the same size as we did those in 1899-00, we should get results very similar to the coupe actually worked in that year, *vis.*, 188 trees yielding 332 maunds of scented wood. The yield per acre per annum would be  $8\frac{1}{2}$  maunds, valued at not less than Rs.40 net. This I admit is exceptional, but I am of opinion that, under careful treatment, we should be able to work up to this in most localities.

The value of more extensive areas may, however, be proved in a totally different way. The coupes of sandal include both reserved and unreserved land. The latter include not only wastes but also lands under cultivation from which trees are purchased by Government. Enumerations of immature trees have been made for the whole coupe area. Under these circumstances it is clear that a valuation made for the whole coupe is considerably less than it would be if only the actual sandal land were included. The area of Kotadai coupe is 960 acres. Assuming that in the next 40 years the immature trees will be worked out at the same size as those worked in 1902-03, a net revenue per acre per annum of over Rs. 21 is obtained. If the cultivated area were excluded, there is little doubt that the result would be doubled. This area is particularly rich in sandal and may be taken as sandal at its best. I will now consider it at its worst. The Karlia coupe (northern portion) was worked in 1896-97. Between 1893 and 1895 very extensive thefts took place, and in 1895-96 the southern portion was worked over, only the stumps from the illicit fellings being removed. The coupe contains 5,040 acres, of which not less than two-thirds are cultivated land containing no sandal. To

be on the safe side I have taken only half as unproductive. This area was again worked in 1903 and 1,714 trees produced 1,420 maunds of scented wood. The net revenue per acre per annum, even under these very unfavourable conditions, works out to Rs. 1-12-0, which is equal to twice the assessment levied on cultivated lands in the neighbourhood. A natural inference to draw from these figures is that the land on these hills is far more valuable for growing sandal than any other crop, and fortunately this has, to a certain extent, been recognised by Government and still more so by the local revenue officers.

For some years past the various Collectors of the district have steadily opposed the gradual removal of all tree growth from these lands, and of late years a Collector has made some very advanced proposals for protecting this growth. It only remains to be seen if Government will accept these proposals, which I have little doubt they will do if the facts are clearly put before them. An accurate survey of the hills has recently been carried out, and with proper maps the preparation of such estimates will be facilitated.

#### 5.—DISEASES.

‘Spike’ has recently found its way into the district. The localities attacked show that it has not been introduced by contagion from Mysore. Other trees, congeners of sandal, seem to be similarly attacked. From the locality in which it has been found I judge that it may not be impossible to trace the origin of the disease to fire. I hope to deal with this after more prolonged observation.

24th October 1903.

P. M. LUSHINGTON.

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## II.—CORRESPONDENCE.

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### The late Mr. H. C. Hill.

At the time of his death the late Mr. Dickinson was engaged in correspondence with a view to raise funds towards a scheme for the perpetuation of the memory of the late Mr. H. C. Hill. The matter has now been placed in my hands, and I think the best plan will be to bring it to notice in the pages of the *Indian Forester*. The form this memorial should take has first to be decided, and the following suggestions have been made:—

- (1) To found a scholarship at the Dehra Dun School.
- (2) To put up a tablet at the School and give an annual prize, preferably for Sylviculture (Hill's special subject).
- (3) To put up two tablets, one at Dehra and one at Nancy (with the permission of the French Government).
- (4) To add the sum subscribed to that now available for the Brandis Prize, and call it henceforth the Brandis-Hill Prize.



Nos. 1, 2 and 3 would require the sanction of the Inspector-General of Forests (as Local Government for the Forest School).

As to No. 1, for a scholarship of Rs. 10 a month given for the second year of a student's course, it would need about Rs. 3,430 at  $3\frac{1}{2}$  per cent. (Government paper).

As to No. 2, there exist at present two small funds from which prizes are given, one to the best student in Forestry from Madras, and one for practical forestry, but a good prize, open to all the outgoing class, is required for the student that does best in the subject all round. For this there is at present no fund.

As to No. 4, Sir D. Brandis has himself kindly made the suggestion, and his idea is that as there is nothing at present more important than to get men trained at Dehra to take their share in the observing and thinking of the Department, so by increasing the Brandis Prize Fund the cause may be forwarded. If those who would like to subscribe will let me know what proposal they vote for I shall be obliged. I will then write and let each of those whose votes are not among the majority know what proposal the majority has adopted, and they can then act as they like in the matter. I propose to wait for replies till the 29th February next.

A. G. HOBART-HAMPDEN.

Dehra Dun, 28th November 1903.

### The 'Kongu' Tree of Tinnevely.

In a very interesting article on the 'Kongu' tree of Tinnevely, which appeared in the October number of the *Indian Forester*, the writer, Mr. Lushington, describes the appearance and uses of that valuable tree, or, I should say, trees, for there are several species which bear that name. He divides them into the 'black' and the 'white' Kongu, referring the former to *Balanocarpus erosa*, *B. utilis* or *Hopea longifolia*, and the latter to *Hopea parviflora* and *H. Wightiana*. As the identification of the species is not quite complete, perhaps the following notes may be of interest to those who would pursue the enquiry.

With the exception of *H. Wightiana* these trees were all observed for the first time by Colonel Beddome when travelling in South India, but he did not at first discriminate between *H. parviflora* and *H. longifolia* (See Beddome Fl. Syl., XXVII). The last named was separated as a distinct species by Sir W. Thiselton-Dyer, but before he had obtained the fruit (Fl. Br. Ind., I, 309). Subsequently Colonel Beddome obtained complete specimens of *Balanocarpus erosa* and *B. utilis* and formed a new genus of that name. At the same time he remarked that the latter, 'when in flower only is scarcely distinguishable' 'from the long leaved

variety of *Hopea parviflora*, that is *H. longifolia* (Beddome Fl. Syl. CCXXXVII).

In his *Flora of Trees*, Vol. I, 130, the late Dr. Trimen distinctly states that *B. utilis* and *H. longifolia* are the same, and Sir D. Brandis in his *Indian Trees* at p. 71 gives *H. longifolia* as a synonym of *B. utilis*. The former name should therefore be struck out in favour of the latter.

The two species of *Balanocarpus* may be thus distinguished:—

Young branches glabrous, leaves obtuse, petiole  $\frac{1}{4}$  in., panicles glabrous, nut  $1\frac{1}{2}$  in. long by  $\frac{3}{4}$  in. — *B. erosa*.

Young branches hoary, leaves acute, petiole over  $\frac{1}{2}$  in., panicles hoary, nut  $\frac{1}{2}$  in. long and broad—*B. utilis*.

As regards the white kongu, under which Mr. Lushington includes both *Hopea parviflora* and *H. Wightiana*, the differences between these trees are as follows:—

Leaves  $3\frac{1}{2}$  in. by  $1\frac{1}{2}$  in., petiole  $\frac{1}{2}$  in., panicles grey-tomentose, flowers  $\frac{1}{8}$  in. across, cream-coloured, wings of the fruit straw-coloured under 2 in. long—*H. parviflora*.

Leaves  $\frac{5}{8}$  in. by  $\frac{3}{4}$  in., petiole  $\frac{1}{2}$  in., panicles glabrous, flowers  $\frac{1}{2}$  in. across, yellow tinged with red, wings of the fruit red,  $\frac{3}{4}$  in. long—*H. Wightiana*.

*Hopea parviflora*, called thambagam or kambagam in Travancore, is found in most of our evergreen forests between sea level and 3,000 feet, and at all elevations it is found scattered through the forest, often in groups. In the low country it is generally to be seen on riversides, but this is because it has been cleared away from the adjacent land, for where groves or patches of forest have been left this tree is found in them, even far from water. At the same time it is a tree that likes moisture, for it thrives in swampy patches where other trees would die.

It flowers in January-February, and its fruit ripens in May-June. The seedlings spring up readily and may be found under the parent trees in vast numbers, but in the dense forests poles are not often seen, as they cannot bear very heavy shade. Nice young trees are often to be seen springing up on land that has been cleared by hillmen and abandoned, for there they can get sufficient light.

There is no difficulty in obtaining seed for sowing, but the seeds are very delicate, and only a small percentage germinate. The transplanting of small plants from the forest is not much more successful, as they do not bear removal.

The age of thambagam cannot be readily ascertained as there are no annual rings in the wood, but the growth is probably fairly fast. The best of a group of trees planted ten years ago and recently measured was 61 feet high and 7 inches in diameter at breast-height, and a 15-year old tree was 9 inches in diameter, though it had been retarded in growth by the cutting of some of its roots.

Thambagam is very hard, heavy and durable. It is used for building and is much valued for boats. It is superior to teak for out-of-door work, such as bridge-building and for sleepers. Its present value is about Rs. 1-8 per cubic foot sawn, and the demand is unlimited.

*Hopea Wightiana* is a much less common tree, and as far as I have observed, it is confined to the lower elevations. In former times, when evergreen forests spread all over the low country, this tree was doubtless common enough. At present one sees a few trees in groves or on the sides of rivers and that is all. The wood is good but it is little known.

T. F. BOURDILLON.

QUILON, 2nd November 1903.

### Notes on the Forest Nursery and Plantations in the Panch Mahals.

YOUR issue for November contains a note on forest nursery and plantations which would have been all the more interesting had Mr. Pearson extended it a little and told us something more about the plantations themselves. He states that some foresters have condemned such works while others believe that good results can be attained at a reasonable cost.

I have just spent some five and-a-half years in the Godavari district of the Madras Presidency—a district with a great variety of forest, from high, which will produce very large timber, to mangrove forest. The district contains about one thousand square miles of reserved forest and eight ranges.

Three of these ranges, bordering on the Central Provinces, contain a valuable species peculiar to itself. Thus in one the prevailing species was *Xylia dolabriformis*, in another teak and in the third *Hardwickia binata*. The rainfall in this tract varied from about 45 inches in the *Hardwickia* range to about 70 in the *Xylia* range, the teak range being the central one and the *Xylia* the easternmost. Prior to reservation the whole of the forests in these three ranges had been subject to shifting cultivation, in addition to which the configuration of the country with the aid of the Godavari and Saben rivers gave every facility for the exploitation and transport of timber, which was rafted to a great central market lower down the river. Immense trees can be found here and there left uncut by the shifting cultivator, surrounded by smaller poles. Now in spite of all the bad treatment that this teak in the central range has received in the past, it persists in coming up, and has fought hard against being exterminated. It produces a harder wood than the Burma and West Coast teak and takes a beautiful polish so as to be scarcely recognisable as teak, and every stick of it could be sold to-morrow, so great is the demand. As the work of settlement in the district was completed it was possible to

pay attention to working-plans, but a thousand square miles is a large area, and even after five and-a-half years I had to leave the district without ever having seen one reserved forest at all, and another only in the far distance. In this teak range the Survey of India party had just started work, so that detailed maps would not be ready for some time. A preliminary plan was therefore necessary. As it was obvious that the policy for the forest was improvement of the stock of teak, the main provision of the plan was for a series of experiments to ascertain how this increase in the stock of teak could be best brought about. It was estimated that twenty-five thousand acres might be dealt with in time out of the seventy-five thousand acres of reserved forest in the range. Here the necessity of a forest bureau is surely very obvious. Here is a range easily exploited, with a large market, which supplies other districts besides this one, all of which have direct water communication with it as well as with a seaport, and in which teak struggles to grow and only requires protection. At present, after years of bad treatment, there is little teak over five feet girth, but we do not know to how large a size it will grow in this locality, and there is an insatiable demand for all sizes. In this Presidency one sees less of men of one's own department than of any other. One may occasionally see men of adjoining districts on social occasions at "weeks," but there are no professional foregatherings, so each man has, in a question like this one of improvement of teak, to work it out for himself. It was thought that in time the taungya system might be introduced, but the subject was considered too important to leave the experiment to others, i.e. cultivators, until the best method had been found out. The teak occurs in patches, so one such patch of twenty-five acres was taken in hand. All the crooked teak were cut over for coppice and the good ones as well as the good ebony poles were left. The good saleable poles of other species were cut for coppice and sold and the balance cut and burned. Pits a yard apart and one foot square and deep were dug and the earth put back before seeds were sown. As the seeds from the local species were not considered good, a ton of seeds was obtained from the Coimbatore district, S. I. This was found to be far more than was needed, as four seeds were put in each square after being soaked for forty-eight hours. There has been a good monsoon, and when I left the district 12 per cent. of the seeds had come up and more were apparently coming. Now this is only an experiment and may be all wrong, and if so it might have been worked differently had there been a bureau to refer to as to how to act in such a locality. These seedlings will have no shade, but if seeds are sown with cereals the resulting seedlings would have none either. It remains to be seen if a reasonable percentage of the seedlings will survive, in order to prove whether the experiment is a success or not. It must, however, be remembered that each seedling established should in time be a seedbearer, for much of the present teak is

only of coppice origin. If this method does not prove a success, then it must be seen how much shade is required and so on, or whether it is not better to have nurseries and plant direct in preference to sowing. On this point it would have been interesting to hear how Mr. Pearson's seedlings have done when planted out. Of this I am, however, sure, that a method of either sowing or planting can be found that will prove of great advantage to immense areas of forest, which contain such a great proportion of undesirable species and where little is being done at present to increase the stock of saleable species. It is a pity that there is not a central bureau to refer to, as it would save a lot of time in local experiments. In this instance the sale proceeds of the poles sold well covered all the cost of the experiments. It would be interesting to hear of other experiments to improve the stock of the superior species over considerable areas. It might be mentioned that there is good general reproduction in these forests except for teak, as the good seedbearers were mostly felled, it reproduces well in coppice and by shoot.

H. F. A. Wood,

*District Forest Officer, Kurnool District.*

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### **The Assam Forest Report, 1901-02.**

In the *Indian Forester* for the current month, when reviewing the Assam Forest Report for 1901-02, you have assumed that at the time of the preparation of the Dambu working-plan fifteen years ago, no attention was paid to the question of the extraction of produce from the forest. As I was largely responsible for the preparation of the plan in question, I write to say that your assumption is incorrect. A cart-road was being made to the forest while the data for the plan were being collected, and this road was, if I recollect rightly, actually in use for the transport of scantlings before the plan was published. All the Forest Officers concerned, from the Inspector-General downwards, believed that this road would prove to be suitable and sufficient for the purpose it was intended to fulfil, that is to enable timber to be transported from the forest to the plains. The omission, therefore, to which you refer, did not exist. Even had your supposition been correct, your homily on so elementary a professional principle as that involved would, I think, have been unnecessary. Now-a-days the orders regarding the preparation of working-plans are far too precise for the question of the extraction of produce to be lost sight of.

Your sneer at the scarcity of labour being said to have delayed the preparation of the new Goalpara working-plan could hardly have been made were you acquainted with the prevailing local conditions.

This is a point on which Forest Officers now serving in Assam can enlighten you, if they think fit, better than I can, who have not seen the province since 1891.

CAMP CHAMBA,  
11 *th* November 1903.

C. P. FISHER,  
*Deputy Conservator of Forests.*

### III.—OFFICIAL PAPERS AND INTELLIGENCE.

#### Prizes at the Imperial Forest School.

It will doubtless interest many of our readers to know that the students at the Imperial Forest School are not asked to work hard through the two years' course without being offered some reward and being shown some honour at the end of their labours. We append below a list of the prizes which will be offered at the end of next March. We feel sure that while the Service as a whole is deeply indebted to the Honourable Member for the kindly thought which has led to its offer, there will be keen competition amongst the students for the prize so graciously offered by the Hon'ble Sir Denzil Ibbetson, K.C.S.I., since to win it will mean to have earned distinction indeed.

The prizes to be offered at the end of March next will be as follows, provided the Board of Control considers they have been earned.

(i). *The Member's Prize*.—Offered by Sir Denzil Ibbetson, K.C.S.I., the Hon'ble Member for the Revenue and Agricultural Department of the Government of India.

The prize will be awarded by the Director and the School Staff to that one of the outgoing students who is, in their opinion, likely to make the best Forest Officer. All qualifications will be taken into account, whether intellectual, professional, moral, or physical. The prize, of the value of Rs. 75, will be given in the form of books, instruments, or other useful articles, to be selected by the winner subject to the approval of the Director.

(ii). *A Prize for the best Senior Upper Class student*.—That is, for the student in the Senior Upper Class who has during the whole course received the greatest number of marks, all subjects together.

(iii). *A Prize for the best Senior Lower Class student*.—That is, for the student in the Senior Lower Class who has during the whole course received the greatest number of marks, all subjects together.

(iv). *A Prize for Forestry*.—This will be a prize for that student of the Senior Upper Class who has obtained most marks in Forestry.

(v). *The William Prothero Thomas Prize for Practical Forestry*.—This prize will be given to that student of either the Upper or Lower Senior Class who, in the opinion of the School Staff, has shown the best practical knowledge of Forestry. It will be in the form of a book or books.

(vi). *The Botany Prize*.—For the student of the Senior Upper Class who obtains most marks in this subject.

(vii). *The Forest Engineering Prize*.—For the student of the Senior Upper Class who obtains the largest number of marks in this subject.

(viii). *The Campbell Walker Prize*.—For the Madras student of the Senior Upper Class who has obtained most marks in Forestry during his school course.

(ix). *The Inspector-General of Forests' Prize*.—For the best athlete in the School. This will be annual and will be adjudged by the School Staff to the best all-round man.

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#### IV.—REVIEWS.

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#### **Review of Forest Administration in British India, 1901-02.**

GOVERNMENT Reports nowadays afford but slight scope to their would-be reviewers, and perhaps the more gifted, the more facile the pen the greater the difficulties which present themselves for solution in unweaving points of interest from the tangled knot of statistics and figures in which they are inextricably wound. For has it not been written that 'Fools rush in where angels fear to tread.'

This being so it might be suspected that your reviewer had either stupidly bracketed himself with the former class or vaingloriously assigned unto himself a place amongst the occupants of the realms of light. In this instance, however, he has done neither the one nor the other, for the Report before us, whilst taking to itself all the credit nowadays given to shortness, clearness and conciseness, at the same time provides food for thought and contains suggestions and advice which will be perused by the Department as a whole with as great an interest as by Local Governments and their senior Forest advisers.

We do not propose in this review to tread the well-known, and well-worn (at least in the pages of the *Indian Forester*), route pursued so often by your reviewers, commencing with 'I.—Alterations in area' and finishing at 'Ch. V.—Establishments.' Of surpassing interest no doubt are the details (and closely serried columns of figures connected with area, surveys, breaches of Forests law (in which Bombay stands so pre-eminently first that one is tempted to wonder whether the Forest Officer of that Presidency.

is qualifying for a policeman's billet), fire, grazing, etc., but we are of opinion that those who really wish to know how the Department has shown up in these matters during the past year will consult the Report for themselves, whilst the rest will not be greatly benefitted by the necessarily short and abridged extracts, which is all that could be given in a review of this nature.

To those who have given the matter but slight attention, and even to many of those who cannot be classed in that category, it will come as a surprise to learn that 22·22 per cent., or over one-fifth, of British India is administered by the Forest Department, and when one remembers the smallness of the staff and the magnitude of the interests involved, the surprise comes to one rather in the nature of a shock.

Forest settlement work is proceeding apace throughout the country, great progress having been made in Burma and Madras during the year. We note that work of this nature is also being undertaken in Bengal, the Central Provinces and Assam. In many provinces the boundary demarcation is nearly complete; in others, such as Burma, it is keeping pace with forest settlement, whilst elsewhere, as in the Punjab, Madras and Bombay, much still remains to be done.

Perhaps the paragraphs of greatest interest professionally to be found in these annual reviews of the Inspector-General are those devoted to the subject of working-plans, and we find much of importance in the present one. The following paragraph is worthy of being quoted *in extenso*. 'The Government of India have recognized that elaborate working-plans are, as a rule, unnecessary in forests where, owing to absence of demand, it is impossible in the present conditions of forestry in India to give effect to any scheme of systematic working. There can be no doubt that in the past, owing to eagerness to introduce regulated working, money and time have been sometimes unnecessarily expended in the attempt to prescribe for forests, yielding at present no financial profit, a continuous system of management, and that consequently many plans which have received official sanction remain a dead letter; such instances are not uncommon in Assam and the Central Provinces. In the latter province the question of the selection of those areas in which sanctioned working-plans are to remain in abeyance is engaging the attention of the Forest officials, and it is hoped that in future it may be fully recognized that a demand for forest produce is the main justification for the compilation of a forest working-plan, and that a departure from simplicity in its prescriptions can only be justified when the intensity of that demand necessitates care and elaboration in the effort to satisfy it.' The matter has here been put into a nutshell! In future it will not be a sign of backwardness on the part of the Forest Department if it cannot show a high percentage of its forest areas under working-plans, but more perhaps of backwardness on the part of the province itself, since a



want of demand for forest products must necessarily to some extent imply shortness in population, want of good provincial intercommunications, such as feeder railways, etc., slackness in trade, etc., etc., all of which provincial defects cannot be rightly put on to the shoulders of one Department. We consider that no greater mistake was ever made than the comparison, by Local Governments, of their own progress in the preparation of working-plans with that of other provinces, and the debt they owe to the Government of India for this timely warning is not a light one, since the pursual of the policy above enunciated means a saving both in men and money. We note that in the Bengal Presidency the area for which working-plans had been prepared and sanctioned up to the 30th June 1902, amounted to 24,322 sq. miles, including an area of 1,732 sq. miles newly sanctioned in the year under report, thus leaving a balance of 148,053 sq. miles still to be taken in hand. This latter area includes over 104,000 sq. miles of valuable Burma forests. These figures take no account of the Bombay and Madras working-plans, which are prepared under the supervision of their own Governments, although this policy, from the Government of India's remarks, would appear to be open to considerable improvement. However, we are not so much concerned with that aspect of the case as with that presented by the enormous annual additions now coming under working-plans prescriptions.

Has it been realized what this really means in the additional work the supervision entails upon the Superintendent of Working-plans? We read in the Review: 'The control of some of the existing plans, owing to defective preparation of and to delay in submitting the control forms in the past, is a matter of difficulty, and it is not always possible to discover to what extent the prescriptions of plans have been carried out.' If this has been so in the past what does the future hold in store? Is it not time that the cleaning of the Augean Stable was set about in earnest? At present the establishment for the supervision of this, one of the most important branches of Forest administration, consists of one officer, and it forms but a portion of his work, since he also holds the post of Assistant to the Inspector-General. Our readers are all too educated on this subject by now to render it necessary for us to point to the different state of affairs in Europe and America, and we would suggest for the favourable consideration of the Government of India that the formation of a working-plans branch would make for greater efficiency in our Indian Department, since all will admit (and we feel sure that amongst the first would be the Superintendent of Working-plans himself) that the work has outgrown the capabilities of one man, even were he able to devote his whole time to this work. We make this latter remark advisedly, since our notions as to the supervision working-plans require go far beyond what they at present receive. We would suggest that a branch be formed to be called the 'Working-plans Branch'

and to consist of a Deputy Inspector-General of Working-plans and two Assistants, probably senior Deputy Conservators; that the whole of the control of working-plans be placed in their hands and that they be empowered to tour round the country, including Bombay and Madras, and examine for themselves the soundness of proposed plans or of deviations from existing plans, etc. We would suggest that the advantages of such a branch can hardly be over-estimated, whilst the necessity for its formation is unquestionable.

From the report we gather that the United Provinces and Oudh Government are still by far the most enlightened (or is it their Conservators?) on the important subject of the good housing of their staff. Many if not most of the other Governments could with advantage take a leaf from the Province's book in this matter. In many the accommodation provided for the touring officer is such that one would hesitate to put one's animals in it at home. We have ourselves heard senior officers remark, 'My dear fellow, we lived in mud huts when we first came out. This (a leaky insufficiently thatched bungalow with not a bit of "pakka" about it) is palatial.' We are all ready to admit that such was the case, and the high mortality rate would be in itself sufficient to support this statement. It does not follow however that this state of affairs need continue either for the upper or subordinate staffs. We read in the report under review: 'There can be no question that in many provinces provision of suitable shelter for officers on tour is urgently called for, as having a marked effect on the successful protection and good management of the forests. Those operations which necessitate constant supervision during the inclement seasons of the year, such as fire conservancy and plantation work, cannot readily be carried out without adequate protection against unnecessary exposure, while without the maintenance of health good work is obviously impossible.'

On the subject of plantations and cultural operations the Review speaks with no uncertain note: 'The expense and uncertainty of regular plantations render their expediency doubtful save in very special circumstances, more especially when there exist numerous areas where money would be remuneratively expended in assisting natural reproduction and on works of improvement in the existing indigenous growth.'

'The division between regular plantation work and cultural operations, though actually well defined, has apparently in some cases been misunderstood by the writers of forest reports, and a classification of their operations would seem to be called for. It is proposed to consider the question in connection with the new edition of the Forest Code, which, it is hoped, will shortly be published.'

'In consequence of this misunderstanding it has not in all cases been possible to judge of the extent and cost of operations undertaken with a view to benefit the growing stock, but it is

evident that these are obtaining more of the attention they merit. The information afforded as to the progress of natural reproduction of the principal species is, in most instances, extremely scanty. Records of unfavourable seed years or the reverse are, no doubt, both interesting and valuable if carefully maintained in Divisional Forest Offices, but what is more especially required in Circle Reports is information as to the germination of the seed and continuance of the seedling, a description of the conditions which prevent or encourage regeneration, and a statement of the means which have been successfully adopted for the removal of hindrances to regeneration or of observations made with that object in view. In some circles in Burma special interest is being taken in the reproduction of teak in natural forest. The subject is one of the greatest importance, and will, it is hoped, be followed up so as to afford not a collection of suggested reasons for certain observed phenomena, but a record of facts which have come under actual observation.

On the subject of the removal of forest produce we read : 'There can be no doubt that in the present constitution of the forest staff it is preferable to arrange for the removal of produce by the agency of purchasers and contractors, as this procedure does away with the necessity of close and constant supervision over daily labourers by the forest officials and removes the temptations and other disadvantages incidental to the handling of large sums of money by a low-paid staff. It is recognized however that this system is only possible where an effective demand exists; in the absence of the latter the burden of extracting such produce as would otherwise deteriorate, and even of delivering it to the purchaser, falls upon the Forest Officer until such time as a regular market is created. In this connection the following figures are of interest, since they show the amounts removed by either agency

whilst at the same time giving the total amounts of produce removed during the year :—

PROVINCE.	TIMBER.		FUEL.		BAMBOOS.		MINOR PRODUCE (INCLUDING GRASS AND GRAZING).	
	Removed by Government.	Removed by purchasers.	Removed by Government.	Removed by purchasers.	Removed by Government.	Removed by purchasers.	Removed by Government.	Removed by purchasers.
Bengal Presidency	6,230,861	37,849,950	7,574,518	54,397,645	2,237,630	125,847,562	1,34,658	15,01,875
Madras	389,361	2,760,175*	3,965,639	10,900,457	49,709	38,726,111	38,869	11,06,780
Bombay	1,925,035	2,278,606	4,608,999	23,205,611	94,843	4,229,318	71,689	3,44,828
Grand Total	7,845,257	42,888,731	16,149,156	88,503,713	2,442,182	168,802,991	2,45,160	29,53,483
	1901-02	1900-01	7,015,813	44,515,735	3,162,718	162,081,060	2,22,850	27,38,596

\*The gross revenue realised was Rs. 1,78,23,715 as compared with Rs. 1,97,70,493 in the previous year and Rs. 1,86,94,125, the average of the previous five years. The surplus was Rs. 70,77,327 against Rs. 86,10,453 in 1900-01 and Rs. 82,02,221 in the last quinquennial period. The proportion of expenditure to gross revenue was 60 per cent.

'The gross revenue was thus some 19½ lakhs below that of the preceding year and more than 8½ lakhs lower than that of the preceding quinquennial period, while the net surplus was about 15½ lakhs less than in 1900-01, and 10½ lakhs less than the average of the previous five years. This decrease in the receipts and surplus is referable to the less favourable results obtained in Burma, where the gross revenue showed a decline of nearly 22 lakhs and the surplus decreased in consequence by 21½ lakhs. This falling off is due not to a diminishing supply of timber or to a want of demand in the markets of the world, but chiefly to delays in arrivals at the ports of export on account of unfavourable seasons closing the waterways prematurely.'

We have seen this question of the supply of Burma teak animaladverted upon in an unfavourable manner in various journals of late. We might perhaps instance *Les Eaux et Forêts* and the *Timber Trades Journal* as cases in point, and we trust this explanation of the true state of affairs will be accepted in preference to interested and biased foreign consular statements. In view however of a recent article by a distinguished Forest Officer, now *en retraite*, on the subject, we might perhaps pause to here consider whether the true well-being of the valuable Burma forests is really met by sending the embryo Inspector-General to spend a year or so of his service in that country. Would it not be better, in the interests of the forests themselves, to have one responsible head in the province itself, say a Deputy Inspector-General, to whom the four Conservators would be directly subordinated, and who himself would be Forest Secretary to the Burma Government? With such a head, intimately acquainted with the provincial capabilities and provincial needs (in a forest sense), there would exist in the future no scope for complaints, unjust though they be, of the mismanagement of the Burma forests in the interests of India as a whole.

On the subject of revenue and expenditure the report continues: 'Taking into account the many improvements that are annually being introduced into forest management, and the capital outlay that is still inevitable on survey, settlement, demarcation, communications, etc. it is obvious that the percentage of expenditure to gross revenue must rise with any temporary decrease in receipts; but there is little doubt that as the organization of the Indian forests becomes more complete and capital expenditure consequently diminishes, the annual surplus obtained will approach that yielded by the best managed forests abroad. That this will be the case is the more certain when it is remembered that the minor products of the Indian forests are as yet little known, and that investigation into their occurrence and commercial value is still in its infancy. The attempt to pursue these investigations with the aid of a staff already fully occupied in the protection of the forests and in exploiting their major products must greatly restrict the sphere within which the Department has to confine its investigation, but

with careful research, directed by men of experience and business capacity, it is probable that the true value of the various economic products of the forests will by degrees be ascertained and markets created for their disposal.'

We are not acquainted with the intention or wishes of Government in this matter, but we are of opinion that the question of the discovery and utilization of the many valuable minor products existing in the Indian forests would be immensely facilitated and aided by the appointment of an Imperial officer, whose duties would consist in making himself acquainted with, and in experimenting with their products with a view to placing them upon the markets of the world or of creating markets for them. It is not apparent that the efforts in this direction made by non-departmental officers have led up to date to any great practical advance as far as the Department is concerned. In view however of the mention of the absence of a 'Forest Bureau of Enquiry and Investigation' in the report under review we trust that the formation of such a bureau has reached such a stage that its practical feasibility is recognized and perhaps within reach.

In conclusion the report gives some interesting notes on forest conservancy in Kashmir, Mysore and Jodhpur. Those on the subject of the Mysore forests are perhaps of greatest interest, since our perusal of the Officiating Conservator's Annual Report has failed to show us exactly what was being done by the department as a whole in that Province. So onerous and so efficient in his own opinion had been the work accomplished by the Officiating Conservator himself that the detailed enumeration of it left apparently but scant room for any mention of that done by his highly efficient staff. We are surprised therefore to note that the report under review asks Mr. Muttanah some questions which would seem to call for an early explanation. It may be that the Officiating Conservator has not grasped the fact that the work required of a Conservator is administrative and that he is provided with Deputy Conservators to carry out executive duties. We think that Mr. Muttanah will fully agree with us that the charge of such valuable forests as those of Mysore require intelligence and administrative ability of the highest order.

## V.—SHIKAR AND TRAVEL.

### **A Morning after Goral**

THE sun has not yet shot up over the neighbouring peaks as we breast the steep winding path leading to the crest of the mountain we are bound for. It is a fresh beautiful morning in early June, and at the elevation we are at—between 7,000 and 8,000 feet—crisply cold. The keen morning air and the stiff climb send the blood coursing merrily through the veins, and one feels in tune with the glorious scene around one. Are we not many, many.

miles distant from the scorching plains, right up amongst the most glorious scenery the world contains, in the mightiest of mountains, the Himalayas. Is not one blessed with a sound wind and good lungs and head and is not one full of hope that the crest of yonder ridge will disclose the whereabouts of a beast as yet unmet and unshot—an animal whose level plain is the rockiest and most precipitous of precipices. Does not a feeling of contempt pass through one as one remembers the Home sportsman. He who with time and money both at his disposal, year after year is content to shoot tame deer and barn door pheasants and call it sport, whereas a little energy would enable him to obtain the sport of kings. But he would have to work for it! Wind and limb, head, hand and eye must be good for mountain shooting, as often a false step or slip means a drop into eternity over some terrific precipice. This does not, however, come within the contemplated bill of fare of our home sportsman.

As we toil up the slope a rush in the bushes to our right brings the rifle to the ready, but almost before one has had time to try and peer through the growth, a couple of short sharp barks proclaim the animal a barking deer, alarmed at such an early visit from the two-legged biped. Will the barks have raised the hill-side one wonders! Luckily they are not repeated. Further up two monal pheasants get up, offering a lovely shot, and fly off with their queer piercing whistle. A sudden halt of the shikari and I hurry up, only to find another barking deer, this time down the khud. Not much time would he have allowed for a shot had it been wished for, for with a whisk of his white tail he is off at breakneck speed. Up, up we climb, and at last reach the crest; every open patch of grass and rocky precipitous slope is searched, but in vain. Either the barking deer have roused them or our eyes are not sharp enough, for no horn of goral appears. After further fruitless search we turn into a small path and drop down the hill on to a small contour path someway below. Just before reaching the crest something had bolted down through the jungle in this direction without our having caught sight of it. After winding along the rocky cut for a mile, suddenly the shikari drops like a stone and I promptly follow suit. 'To the left of the big pine in front,' he whispers, and I crawl into his place. For some time nothing can be made out at all; then a minute greyish blotch, taking a sort of goat-like shape, defines itself to our earnest gaze, and one or two other dots I take to be companions. I worm along a few yards further and then sit up. From here I must fire for I can get no closer. Had I been above I should have tried, but being on the same level it was too risky, as the animals were on the *qui vive*. Resting my rifle on my knees I take a full sight for my estimate of 150 yards and fire. The goral gives a great bound in the air with arched back and appears to then spring straight over the khud. Its companions disappear like phantoms. Hit, I was sure, and in my excitement I bark my shins and nearly

come a cropper in trying to get hurriedly over breakneck ground. A very short examination shows blood. At first a little and then in patches, and I no longer doubt that I have shot my first goral,



Step by step we track it up, and as is usual with these animals, it very soon takes us to - a place where the hillside is virtually a



precipice. Slowly and carefully I follow my nimble-footed companions. I vaguely wonder how many generations it has taken to give them their easy gait and swinging stride over the rocky khud side and how many would be required to give the average Englishman even a fraction of their agility. I plod along, sticking to my rifle and thanking the good star which induced me to put on a stout pair of football boots, which answer here even better than nails. At last we come to sheer slippery rock, and this tries my powers to the utmost. However good one's head, one can't walk on shiny rock at an angle of 60°. I get over encouraged by frantic pantomime from my orderly, who appears on the high road to lunacy and to losing me my goral. In a woful plight I reach the other side, blowing and shaking, for the last 100 yards or so have been real hard work. After a little time I make out a slowly moving grey speck (the hind leg is broken at the hip, so I am told), and steadying myself as much as I can, I fire. The beast stops dead for an instant, I thought preparatory to falling, and then with incredible swiftness bounds off on three legs over some terrific country, rounds a point and is out of sight. I mutter something not complimentary to myself, but am not particularly downhearted—though I really believe that shot to have been a miss—as I feel certain of getting my beast. How little I knew the goral! But the khud had now to be negotiated. The hill from a point some 1,000 feet above us dropped down at a sharp angle, but was more or less clothed with trees—deodar, spruce and silver fir. This growth, however, stopped just above us, and the khud inclined strongly into a practically sheer rocky precipice, with just a ledge here and there to get along by. Luckily there were tufts of grass in niches which proved a great help. This lasted to the corner round which the goral had bolted. My companions proposed that they should go straight and that I should climb up to the forest and then come along in that, but I was far too keen to go this round and said I would follow them. All went well except on one or two occasions when I spread-eagled myself (how one gets into these weird positions I don't know—a kind of tying oneself up into knots!) and had to be hauled out. Twice the men overran the blood in their eagerness and had to try back. At last we got round the corner, and the trail took us up to the tree growth, then round another corner, where a tree had fallen across the ledge we were on. Here we lost the blood and had to spend some time hunting for it. I had my rifle in the hollow of my arm when a rush in the deodar growth above, a dull grey blotch for an instant, and the goral was off down the khud back on its old tracks again. He passed close to the orderly, who saw the hanging leg and a large blotch of blood on the quarter. He yelled aloud in his excitement and has not been allowed out shooting with me since. Back again we went, and I made for a big craggy rock sticking out on a spur and hanging sheer over a precipice from which I thought I might be able to spot the beast. All below

me was, however, quiet and tenantless, the precipitous rocky slope lying bathed in a brilliant sunlight, and as it was warming up by now I had little hope of finding the goral in the open unless he fell. After searching every spot I was able to I returned to where I thought the men would be and found them right enough, squatting!! Oh! how the native loves to sit! To my excited questions they replied that there was no blood in the direction he had gone and so it was useless to look for him. I could not make it out at first, but I soon saw that the blood having ceased to flow, the patch on the flank would soon dry in the sun and there would be no further stains left. I now began to realize what goral shooting in this kind of country means. A wounded beast invariably makes for the worst possible country, and the chance of finding him here is very small. I made the man hunt about for another hour and then had to give it up. It was very annoying, and I could not help thinking of the sufferings of the poor brute, which would never live after the large amount of blood he had lost, we having seen the grass in places quite sodden with it. It was a hot tramp back on what I believe was meant to be a path, but it was entirely overgrown when it did not consist of naked rock. And yet it was enjoyable. The country and the glorious mountains all bathed in a flood of sunlight were magnificent, and one felt that the crowded city and civilization were far—very far from us that morning. The mountain air was beautifully fresh and the birds trilled and carolled sweetly around us, and oft and anon from some woody glen far below us the sweet notes of the cuckoo would vibrate tremulously on the air. Men were sent out to search the foot of the precipice, but without result, and a heavy storm coming on washed out all the blood stains. So ended my first experience of goral shooting, and the loss of a good head was due to over-confidence, want of knowledge of the elementary principles of the sport, and last but not least, bad shooting. But the broad road of failure will often show the bye-path to success, and this I found later on to be the truth in my case.

THE VAGRANT.

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## VI.—EXTRACTS, NOTES AND QUERIES.

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### **The British Association at Southport.**

#### COMMERCIAL ASPECT OF AUSTRALIAN FORESTRY.

BEFORE the members of the British Association at Southport on Wednesday, Mr. E. T. Scammell, F.R.G.S., formerly commercial representative for the West Australian Government, delivered an interesting address upon "The Forest Resources of Australia available for British Commerce." Mr. Scammell said:

One of the most important duties requiring the early attention of the Federal Government of Australia is that of dealing with the forest resources of the Commonwealth. At present the forest laws and regulations in force, according to the opinion of the Victorian Royal Commission on Forestry, 1901, are 'weak, unsystematic and inefficient.' This has been acknowledged at different times by the various Governments of the Australian States, and desultory efforts to introduce some scheme of State regulation have been made, but no scientific and comprehensive plan on the lines laid down by France, Germany or British India has, apparently, been seriously considered, or, at any rate, attempted. Referring to the need of forest conservation and management in Greater Britain, Professor Schlich says: 'Surely the time has come, or, rather, it came some time ago, for a more vigorous forest policy on sensible lines throughout the Empire. Let us strive to introduce systematic forest management, more particularly into Canada and Australasia.' The question is no doubt beset by great difficulties, but where there is a will there is also a way. Above all, let the self-governing colonies consider the magnificent example which has been set them by India, where the preservation of the State forests has now been put on a safe basis, for the everlasting benefit of the people of the country and the Indian exchequer. Humboldt says that 'men in all climates'—by the indiscriminate felling of trees—'prepare at once two calamities for future generations—a want of wood and a scarcity of water.' In order to avoid these calamities, which will as surely fall upon the New World as the old, unless prevented by wise and timely action, it is incumbent upon British Colonial Governments to give the question of forest control and development their most careful and enlightened consideration.

I am glad to know that the labours of the Victorian Commission have resulted in a strong recommendation being made to the effect that the action of the Government of India should be followed by the Legislatures of Australia. It is satisfactory also to note that the Western Australian Government have lately appointed a commission for the purpose of obtaining information and of recommending measures for dealing with the forests of that State, while New South Wales and Queensland are considering proposals having similar objects in view. The way, therefore, is being prepared for concerted action on the part of the Federal Government by co-ordinating, as far as may be possible, the efforts that are being made by the various States of the Commonwealth, and by advising the adoption of measures which, while applicable to the separate States, shall be suitable to the country at large.

#### THE FOREST AREAS OF AUSTRALIA.

The magnitude and importance of the interests involved may be judged by the fact that the forest areas of Australia comprise 107,637,000 acres of marketable timber, or nearly half the areas of the forest lands of Europe, excluding Russia. Of this area

Queensland possesses 40 million acres, New South Wales 20 million, Victoria 12 million, South Australia 4 million, Western Australia 20 million, and Tasmania 11 million acres. To this should be added a considerable area in Queensland (over 100 million acres) and in Western Australia (over 70 million acres) covered with inferior timber, which has a local value for building and for general purposes.

Many, if not most, of the important forests of Australia are fairly accessible from the sea, as the best grown and most valuable timbers are mainly coastal. This especially applies to the belts of jarrah and karri in Western Australia, which occupy clearly-marked and distinct areas on the hill ranges of the south-west, which skirt the coast for some hundreds of miles; and also to Tasmania, whose forests of blue gum and stringy bark grow down to the shores of that forest-clad island. In Victoria the southern forests, which correspond very largely to those of Tasmania, are not far from the sea, while in the northern part of the State, where the timber is akin to that of New South Wales and Queensland, considerable areas border on the River Murray. The subalpine regions of Victoria, however, where some of the finest timber of that State is found, are at present practically inaccessible. In New South Wales and Queensland a number of the largest and most valuable belts of forest land lie between the dividing range and the sea; but in both these States there are large areas too far from the coast to render them serviceable as immediate sources of supply.

#### THE COMMERCIAL TIMBERS OF AUSTRALIA.

The timbers of the Commonwealth are of many varieties and some of them of high commercial value. The chief of these, as shown in the great work of the late Professor Baron von Mueller, are the eucalypts, which are indigenous to Australia, and are found in all parts of the country. Of the valuable timber alone there are over 150 species. Besides the eucalypts, there are many kinds of casuarinas (the Australian oak), some conifers (the Moreton Bay pine), the cypress pine, the brown pine or colonial deal, and others, many acacias (the Australian wattle), banksias, and numerous other varieties.

At present, however, the range of Australian woods available for British commerce is limited. Western Australia and Tasmania are the only States that have seriously dealt with the question of exporting timber, or of using the forest resources as a valuable commercial asset. New South Wales is beginning to enter the field, and Queensland should be able to utilise her timbers for the supply of outside markets. But before these States can hope to compete with Western Australia or Tasmania, or in any way to command the attention of timber users in this country, they must issue, under authority, a definite and reliable statement of the timbers available for export. General statements on the

subject—of which the Government books are full—are of no practical use, nor are the tests, proving the strength and general value of the timbers, such as those issued by the Queensland and New South Wales Governments, unless accompanied by reliable data as to the timber actually available. For example, two of the most useful eucalypts of Australia—ironbark and tallow wood—to which special attention has recently been called by the New South Wales Government, are said to be so restricted as to render an export trade of any magnitude impossible. There are, however, other varieties of timber in New South Wales and Queensland, of which there should be an ample supply. In the case of Victoria and South Australia, notwithstanding the proposed efforts to conserve and increase the forest resources of these States, there is little probability of any export trade in timber being possible for many years to come. Our attention, therefore, for the purpose of this paper, must be confined, practically, to Western Australia and Tasmania.

#### WESTERN AUSTRALIA.

The leading timbers of this State are the well-known jarrah (*Eucalyptus Marginata*) and karri (*Eucalyptus diversicolor*), which occupy a computed area of 8,000,000 and 1,200,000 acres respectively in the south-western district. The average size of matured jarrah trees is from 90 to 120 feet in height, and from 3 to 5 feet in diameter. The stems are straight and clean, and rise 50 to 60 feet without a branch. Karri is a still finer tree, its height averaging 200ft., diameter 4 to 6 feet, and its stem rises branchless from 120 to 150 feet. The colour of the matured woods is red, and it is difficult, even for experts, to tell from the material itself the difference between them. The usual test is by burning, when jarrah is found to leave (ordinarily) a black clinker and karri a white ash. Both timbers are largely used for harbours and dock purposes, railway sleepers, and wagons, and street paving. For structural works karri is preferred, as it possesses greater lateral strength than jarrah. But for general uses jarrah is (locally) in much greater demand, and is esteemed the better wood. These timbers, when sound, possess, in common with some other Australian woods, great immunity from the attacks of marine and land insects, and are comparatively non-inflammable. The former characteristic renders them suitable for sea work of every kind and for use in damp ground, while the latter renders them useful as a fire-resisting material, on account of which, I understand, an order has recently been placed for karri sleepers for the Baker Street to Waterloo tube railway by the Underground Electric Railways Company of London, Ltd. The durability of karri and jarrah is universally recognised. Samples of timber which had been in use for piers and railways and for underground work for many years (such as those shown at recent exhibitions in Paris, Glasgow and London) prove that they

compare favourably with the best hardwoods of the world. The usefulness of these woods for street paving in this country is also well known.

Of the other timbers of this State available for export *Tuart* (*Eucalyptus gomphocephala*) occupies the first place. This timber, in strength and toughness, is one of the best, if not the best, of all Australian woods. But the limited area it occupies renders a large export trade in it impracticable. Red gum (*Eucalyptus calophylla*) is a strong and useful wood, and has a very wide range. It requires, however, to be carefully selected, as it is often marred by numerous veins. These, however, exude a gum which possesses important medicinal properties, and is used locally for tanning. The term "red gum" is common to many Australian eucalypts, particularly to the *Eucalyptus rostrata* of Victoria and the *Eucalyptus resinifera* of New South Wales. *Wandoo* (*Eucalyptus redunca*) is a wood that needs to be better known. It covers a considerable area, and it is computed that there are from 6 to 7 million loads of marketable timber available for use or export. It is well suited for railway and wheelwright work. *York gum* (*Eucalyptus loxophleba*), another widely-distributed timber, is a strong, tough wood, suited for general purposes. The same also may be said of the *yate gum* (*Eucalyptus cornuta*) and other eucalypts of this nature, of which this State and Australia generally possess a great variety. The *Acacia saligna* (a species of wattle) supplies a valuable tannic acid—mimosa tannin—of which the bark contains about 30 per cent. The well-known raspberry jam (*Acacia Acuminata*) is a beautiful wood, suitable for cabinet work. Another acacia, the *badjong* (*Acacia microbotrya*), is used for barrel staves and soft wood joinery. There are many other timbers in this State—*casuarinas*, *banksians* and *conifers*—suitable for building, furniture and fancy work, which are available for export.

#### TASMANIA.

The most important and best known tree of the Tasmanian forests is the blue gum (*Eucalyptus globulus*). Its name is derived from the colour of the young growth. In size it compares with *jarrah* and *karri*. The colour of the matured wood is golden yellow to purplish brown, or buff. It is in considerable demand for harbour works. Good piles, like those supplied for the national harbour works at Dover, can be obtained up to 100ft. in length, with only a moderate taper. It has been tried for street paving in London, though with only moderate success. If sound and well selected, blue gum is one of the most important and valuable trees of Australia, and, according to recent reports by the Government of Tasmania, is available in any quantities. On account of its rapid growth, and the pungent and odorous exhalations from its leaves, it has been widely planted in Southern Europe, particularly in malarial districts, with most beneficial results. In South Africa, India, and particularly in the Southern

and Western States of America, extensive plantations of blue gum have been made. In a report on "Eucalypts Cultivated in the United States," issued by the U.S. Department of Agriculture, 1902, this tree is described as the best all-round eucalypt. As an illustration of its use for harbour purposes, the report states that a contractor, who was constructing a pier at Oceanside (California), required a few piles of Oregon timber to complete his contract. As these were not, for the moment, to be had, he obtained from a neighbouring plantation some piles of blue gum. When it became necessary, some years later, to repair the pier these were found to be the only sound piles in the structure. 'The demand for these piles,' the report states, 'is now greater than the groves of eucalyptus can supply.'

Stringy bark (*Eucalyptus obliqua*) is a more widely distributed tree than blue gum. It attains an immense size. The timber varies considerably, according to the situation and soil in which it grows. It is used for similar purposes to blue gum, but it is more subject to gum veins, and has, therefore, to be carefully selected. It should be serviceable for street paving, but its tendency to warp and shrink renders careful seasoning and preparation necessary.

Among the other timbers of Tasmania which are available for export, blackwood (*Acacia melanoxydon*) and myrtle (*Fagus cunninghamii*) are the best known and most in demand. Blackwood is extensively used for furniture, panelling for railway carriages, wainscoting and interior fittings. It resembles cedar in appearance. Alcock & Son, of Melbourne, use it for billiard tables, and Collard & Collard, of London, for pianos. It has lately been supplied to the Admiralty for gun carriages, having passed the necessary test in the Government arsenals. Myrtle has been favourably reported upon by Messrs. Ransome, sawmill and mechanical engineers of Chelsea, for its strength and high finish. Fine examples of its use, with blackwood, for dados and wall linings may be seen in London.

In addition to these there are the Huon pine (*Dracrydium franklinii*), an exceedingly fine timber, light and strong, which should constitute a useful and valuable commercial asset for local and export purposes.

#### NEW SOUTH WALES AND QUEENSLAND.

I do not propose to give any detailed description of the timbers of these States, since, as already indicated, sufficient particulars are not to hand to justify any confident expectations of a continuous supply for commercial purposes. The only timbers from New South Wales that are being exported to any extent are blackbutt (*Eucalyptus pilularis*), which is being used for sleepers and railway wagons, and tallow wood (*Eucalyptus microcorys*), which is being sent to South Africa for use as sleepers. Blackbutt is in colour a lightish yellow or brown. It grows to a height of from 50 to 150 feet, with a diameter of from 2 to 4 feet. Like other Australian

hardwoods, it is liable to warp,' and requires careful seasoning. There is a difficulty at present in securing large sizes for exportation, for which there is an increasing demand. Tallow wood is of a clear yellow or light reddish colour when newly cut, but changes afterwards to a pale brown. Its average height is from 100 to 120 feet, and its diameter 6 to 8 feet.<sup>11</sup> Its common name is due to the greasy nature of the wood. It is largely used in Sydney for street paving, and with blackbutt and box (*Tristania conferta*) is being tried for that purpose in Westminster.

#### CONCLUSION.

My object in bringing forward at these meetings a practical subject of this nature is to aid, as far as one is able, the efforts that are being put forth by scientific, as well as commercial, men to promote the interests of our Colonies, the development and progress of which cannot fail to be of deep concern to this Association. It will, I am sure, be readily granted that the more widely the products and the possibilities of these great Colonial possessions are known, the more clearly will the fact be accentuated that our interests, whether scientific, industrial or commercial, are one.

At the conclusion of the address, Mr. C. C. Lance, commercial representative of the New South Wales Government, remarked on the practical character of the paper, though, at the same time, he felt that Mr. Scammell had scarcely done justice to the woods of New South Wales, which were more varied than those of any other Australian colony. Considering the size of Australia, it was only natural that there would be a great diversity in the timber, and although, generally speaking, eucalyptus was the principal, that in itself varied a great deal. Jarrah and karri were the timbers that had been brought more prominently before the public notice, and to West Australia belonged the credit of having developed this industry. New South Wales was now coming forward, as was illustrated by the fact that contracts have been secured with the Cape railways for a large number of sleepers. With Mr. Scammell's remarks respecting the non-flammability of Australian woods he quite agreed, but was of opinion there had been some stupid naming. For instance, turpentine would suggest that the wood bearing that name was highly flammable, whereas just the opposite was the case. From a commercial point of view, there were too many different names for timbers which were so much alike. He agreed that the Government might do more by preparing statistics of the quantity of timber available, and would certainly represent this to them.

The Chairman (Mr. A. C. Seward, M.A., F.R.S., President of the Botany Section) said the members of the Association were always glad to hear something of the varied resources and nature of timbers. Sometimes botanists were apt to forget the importance of the wider prominence concerning forestry, and it was appropriate to have this matter brought before them. On behalf of the section,



he expressed their gratitude to Mr. Scammell for having introduced the subject.

Mr. Scammell illustrated his remarks by means of a series of limelight views, and subsequently invited the company to inspect an interesting collection of samples of Australian woods.

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### Home Timber in Wales.

THE home timber trade in Wales at present is rather quiet; nevertheless, the tone is fairly well for the approaching winter. Naturally, at this time, merchants are desirous to clear the woods of all timber felled, if they have not already done so. It is not wise to leave logs lying about until the wet weather sets in, as in most cases our woods are awkwardly situated, and badly laid out, and the result is that if the logs are left until winter, unless we have hard weather, much more labour is required.

On the whole, we have had a very catching wet summer, and we have of late been in woods, soft and boggy, which it would not be wise to take teams into should the wet continue. Much of last spring's oak has been delivered; nevertheless, there is much still lying out for want of customers. And yet, comparatively speaking, there has not been so great a quantity felled as in many years past, when the supply has been scarcer. The demand has fallen off in many of the local districts, as was anticipated, but we believe it will prove differently during the coming winter.

Generally speaking, oak continues at much the same price. We have been over several lots of felled timber of late; some of them are fairly good, while others are altogether unsaleable at required prices.

Two lots we inspected would cost the manufacturer by the time they arrived into his yards about 1s. 10d. to 2s. per foot, and they were not of the first-class type, some of the logs being crooked and others rather small and rough.

There was a time in our own remembrance when crooked oak would fetch a top price for shipbuilding and repairing. We have seen ship repairers, when a vessel was bound to be at sea in a certain time, pay almost any price the merchants would ask, but such times are now numbered with the 'good old days.'

Some of our old wide-awake country timber dealers, when they have a crooked lot on hand, never fail to point these qualities out; but they are generally met with a shrewd shake of the head. Yet there are remote instances in which a call comes for a crook, when a good price is always demanded for goods which before could not be disposed of.

There are some lots, as we have previously mentioned, lying out now, and where merchants have signed contracts for the supply of oak scantling, it would be the better thing for them to secure them than to put it off until later, as there may be in a month or six weeks' time haste with many to purchase.

Speaking of elm, we hear of nothing very pressing. It is a timber which in South Wales is certainly becoming scarcer. We do not mean to say that all our elm is gone. Far from that; yet it is a very prominent fact in our observations that our groves and hedgerows of elms are farther apart and visibly becoming fewer. If Wales had to depend upon her own elm, two to four years would denude her.

Passing over during the last week or so several large estates in the neighbourhood of our consuming centres, we have come across many a stately elm, sycamore, beech, ash and birch of considerable commercial value and sylvan beauty, proving to us that much of the land producing nothing at present could and would produce hard-woods of the finest quality.

We were on a range of hills the other day—the highest peak being 2,903ft. above sea level—and we could not refrain from admiring the beautiful panorama which presented itself to our view. But, alas! the land, which at one time at this season of the year was covered with golden corn waving in the autumn sunshine, was reduced chiefly to grazing meadows, and appeared very bare and brown at that; and many a tract of land which was once covered with oaks and other hardwoods had nothing but a rank growth of scrub and bush.

In making our ascent we made a few practical observations. At the base of this range of Welsh hills we found larch, fir and hardwoods growing luxuriantly, and larch continued up their sides. The last tree we passed was a birch in a very stunted state. Gorse, fern, lichen and grass grow a long way up their slopes, and even to the top of some. Now, the tree lover and scientific arboriculturist will tell you that where these grow there are trees which will grow also, so there, in our endeavours and labours to prompt the reforestation, we take courage, and will yet hope that the day is not far distant when these denuded tracts and those treeless hills and slopes may be clothed with young trees which will in due time add to the beauty of our landscape and also a revenue to our beloved little Wales.

It is a pity now to see so many tracts of land in Wales that would yield timber crops, but which are now lying in a barren state—in the grasp of despairing solemnity.

We find that many of the hills of Wales are composed of limestone conglomerates and sandstone. There is a kind of stone found in some of them of a bluey-red, or red tinged with blue colour. Evidently a sandstone, but of a harder nature than the ordinary red sandstone. These stones or rocks are good bottoms for tree planting, and, furthermore, even on some of our mountain sides, there are rich soils to be found in fairly large tracts which afford splendid sites for many of the pine families.

When will the Government take this matter up and once again reclothe timber-growing districts? Scientists tell us that our vast Welsh coal-fields are the product of submerged forests,

and from personal observations we do not altogether disagree with the theory; and if such be the case, what forests it must have taken to have formed our coal deposits! And if we have to thank the forest for the coal mine, we contend that it is a burning shame to neglect forestry to the awful extent as is done in Wales to-day.

In reference to her present-day woodlands, let us cite one instance. Not long ago we were allotting several coppice woods and plantations for sale in the heart of Wales. These particular woods were planted, and some naturally formed in good soil and on splendid sites; but they had been neglected. The undergrowth was rank and thick, excluding light and air from the young, and choking many of them. Nevertheless, even under these conditions we found hundreds of vigorous, healthy young ash and oak—some young saplings to a height of 30ft., and even 40ft. Now, what would these young trees have made under proper treatment? The cry is, Where shall we get ash and oak from? Our answer is, There is plenty of room in Wales to grow them. Why, along the side of our brooks and little rivers, in deep ravines, the ash delights to grow, and will grow, too. But our land wants nature to plant, to rear, and to produce. Nature did so in ages gone by, when our British forefathers roamed the forests as savages. But these natural forests are gone and gone for ever in Wales. Therefore, human skill and cash must assist her in these days, not merely by planting but by bringing our woods and forests under scientific and experienced management.

We may say here that we cannot in any way recommend mixed planting—pine, larch and hardwoods. The more we see of it the more the failure presents itself to us. A plantation of larch, oak, ash and alder came under our inspection only a week ago. It would be helpful, perhaps, just to note how we found it. The larch was cancerous and stunted in the majority, and covered with the insect pest—quite a failure. The oak, ash and alder we found, in most cases, in a healthy condition. And our recommendation was to fell all the larch and thin the oak and ash out. This plantation was planted on a marly loam on red sandstone on a steep declivity, with a north-east aspect, and a brook of fresh water at the bottom.

The prices of timber in Wales at the present time are :—

			Per ft.
Elm, delivered into yards	..	..	1/4 to 1/6
Ash	..	..	1/6 „ 2/6
Poplar, especially the variety of <i>Populus Nigra</i>	..	..	1/3 „ 1/5
Beech hard to dispose of	..	..	— —
Sycamore, very little offered	..	..	1/6 „ 2
Larch, for boat, boards, etc.	..	..	1/2 „ 1/4
Mining timber 12/ to 14/ per ton, delivered at collieries			

Larch holds the premier position in the market and consequently always commands the highest price.

### **Planting Rubber with Tea in Ceylon.**

THESE pages have recorded from time to time the progress in the planting of rubber in connection with coffee in Ceylon and the Straits Settlements, or the replacing of coffee with rubber, on account of the declining profits of coffee culture, and the feeling of the planters that it is better not to have 'all of one's eggs in one basket.' Of late a similar attitude in regard to rubber has been shown by the tea planters, whose interests in these colonies are even more important than the coffee interest. At the fifteenth annual meeting (June 15) of the Ceylon Association in London--maintained for the promotion of the sale of the Ceylon product--the tea [situation in that colony was reviewed at length by Mr. H. K. Rutherford, who has sent us a copy of his remarks. In spite of the energetic efforts made to promote the sale of Ceylon tea [\$273,234.86 was spent for this purpose in America alone in 1902 by the Ceylon planters] the lower price at which Chinese tea can be bought gives the latter an advantage, even in British markets, without regard to any question of quality. The production of Ceylon tea has increased rapidly, while the prices obtained have declined, and the prospect for extending the consumption does not now seem bright. After referring to these points, Mr. Rutherford said:

While I am on the subject of supply and demand, I would like to bring to your notice another factor, a factor which I do not think has been taken into account, but which I believe will be a most important factor in the near future in the Ceylon tea enterprise. As you are aware, during the last three years the tea proprietors of the low country have been certainly making no profit, if they have not been working at a loss. On that account, as you will remember in the days of coffee, when they turned their attention to cinchona, they are now turning their attention to planting these tea estates with rubber. I was astonished to find it stated in the administration report of the Kegalla district that no less than 4,000 acres of rubber had been interplanted among the tea in that district. That is only one district, and if we consider what is being done in other districts, I would not like to say how much rubber has been planted, but I would not be at all astonished to learn that from 10,000 to 15,000 acres of low country estates have been interplanted with rubber. In the Kelani valley, Kalutara, and minor low country districts there are 60,000 acres of tea, planted in land all more or less suitable for the cultivation of Pará rubber and producing 25,000,000 pounds of [black] tea. It becomes a question that is worthy of consideration as to what is going to happen, for if we take also into consideration the possibility of green tea being a permanent production, even if it does not increase beyond the 12,000,000 pounds now produced, we are face to face with the fact that if this rubber succeeds better than tea, the whole of that 25,000,000 pounds may in time vanish altogether from the black tea output.

Mr. Rutherford was elected president of the Ceylon Association for the ensuing year. He is also a director in The Ceylon Tea Plantations Co., Limited, one of the largest planting enterprises in the colony. The extent of their operations is shown by the fact that they now have invested £248,460 [= \$1,209,129·49] of capital, the amount having been increased several times since 1887, when the amount stood at £75,000. During sixteen years the net profits have aggregated £587,598 5s. 12d. [= \$2,859,548·70], and after paying liberal dividends, and writing off for depreciation, a reserve fund of £100,000 has been accumulated. Part of this has been invested satisfactorily in planting cocoanuts, and now the planting of rubber has been introduced on the estates. These details, by the way, are derived from recent annual reports of the company. In addition, Mr. Rutherford writes to the Editor of *The India Rubber World*:

My company, The Ceylon Tea Plantations Co., Limited, have planted up about 2,000 acres of their low country tea estates with Para rubber. The work was started in 1897 and completed this year. The rubbers are interplanted throughout the tea and thriving well—I am also interested personally in the cultivation of rubber in the Klang district [State of Selangor] of the Straits Settlements, and in that quarter of the world the product promises great things.

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**ALCOHOL FROM SAWDUST.**—At the recent Congress of Applied Chemistry, held in Berlin, Simonson of Christiania described a method of utilising sawdust in the production of alcohol, which the *Country Brewers' Gazette* prints. About two tons of sawdust are boiled with sulphuric acid for three hours, the liquid matter being then extracted by pressure, neutralised, left to stand for 18 hours to cool and clarify, and then fermented for four or five days. The resulting alcohol is afterwards distilled and rectified; and making ample allowance for loss in the latter operation, the yield of spirit is said to be about 2½ quarts per cwt. of sawdust. Trials made with the method on a manufacturing scale are claimed to have demonstrated the possibility of working at a profit, and of opening up a new industry in timber-producing countries, where enormous quantities of sawdust are annually wasted.

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**NEW TOOL FOR TAPPING RUBBER TREES.**—A device for grooving or tapping India-rubber trees is the subject of a United States patent [No. 730299] granted to Fayette S. Robinson, of Boston. It has been designed for use particularly on plantations of *Castilloa elastica*. Briefly described, the device comprises a tongs-like structure having jaws to embrace or partially embrace a tree, and an adjustably supported knife adapted to cut the groove in the tree. When the device is in position, the movement thereof up or down the tree, or around it, causes the knife to cut the proper channel in the bark. The construction of the tool permits

the jaws to widen as they are drawn downward, to allow for the increasing diameter of the trunk. A vertical groove may be cut, or a horizontal groove, or a spiral groove around the tree, as desired. While it is supposed that a single grooving knife will be used preferably, the plan of the invention permits additional knives to be inserted. The patent has been assigned to Ferdinand E. Borges, Secretary of the Consolidated Ubero Plantations Co. (Boston).

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**THE AMERICAN BUREAU OF FORESTRY IN THE PHILIPPINES.**—We note that our American cousins have imported some of their characteristic dash and up-to-dated-ness into their newly acquired possession, and the forest department of the Island appears to have already commenced work on the best possible lines. The American Bureau of Forestry have inspected the forests and prescribed rough plans of working, under which a royalty is charged on all trees felled but that only trees which have previously been selected and marked by the department can be felled and logged by the lumbermen. The forests are thus preserved from that reckless and extravagant cutting which so often follows and accompanies the taking over and opening out of a country by a highly civilized Power. There can be little doubt of the value of the American Bureau of Forestry. India still sits and waits for hers!

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**COOPER'S HILL.**—Our latest news on the subject of the prolongation of the life of Cooper's Hill is by no means reassuring. If public opinion on the subject in India was at all taken into account at home, we should have no fear for the old college. Headed by the leading journal, our Allahabad contemporary, the Indian papers are practically unanimous in their condemnation of the policy of closing an Institution which it is admitted on all sides has turned out a useful body of public servants, for the sake of putting money into the pockets of the few. Can the policy be said to make for the better working of the Departments concerned! *Salus populi suprema lex.*

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## VII.—TIMBER AND PRODUCE TRADE.

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### Churchill and Sim's Circular.

4th November 1903.

**EAST INDIAN TEAK.**—The deliveries for the first ten months of this year are 9,596 loads against 10,481 loads for the same period of 1902, but for the past October they have been 1,214 loads as compared with 501 loads in October last year. There is no change to report in the London market; a clearance sale at auction during the month resulting in a fall of prices, which

should be temporary only, and of which the buyers should reap the benefit. Prospects ahead are still uncertain, the long cessation of regular dependable supplies having introduced an element of instability into the future and in a breaking up of the regular course of the trade.

ROSEWOOD, EAST INDIA.—Sizeable, good logs are in demand at fair prices, but small and poor logs are not wanted.

SATINWOOD, EAST INDIA.—Sales are very difficult to effect as stocks are heavy and demand very dull.

EBONY, EAST INDIA.—For small and inferior wood there is practically no demand, and it is only prime, sizeable logs which are asked for.

### PRICE CURRENT.

Indian teak, logs, per load	...	£10 to £18.
" " planks, "	...	£12 10s. to £20.
Rosewood, per ton	...	£8 to £11.
Satinwood, per s.ft.	...	6d. to 18d.
Ebony, per ton	...	£7 to £10.

### Denny, Mott and Dickson, Limited.

#### WOOD MARKET REPORT.

2nd November 1903.

TEAK.—The landings in the docks in London during October consisted of 937 loads of logs and 535 loads of planks and scantlings, or a total of 1,472 loads, as against 1,268 loads for the corresponding month of last year. The deliveries into consumption were 513 loads of logs and 298 loads of planks and scantlings—together 811 loads, as against 523 loads for October 1902.

The dock stocks at date analyse as follows:—

6,666 loads of logs, as against 6,183 loads at the same date last year.					
3,854	"	planks,	"	3,093	"
—	"	blocks,	"	—	"
Total	10,522 loads		"	9,277 loads	"

The teak market, as shown by the above figures, continues in a very restricted condition, both in respect to imports and consumption. The price for logs of good lengths and quality continues to harden, owing to the fact that most of the recent enquiries have been for special specifications. Planks have been dull; but in face of the shippers only caring to ship against actual orders, any weakening in price promises to be of a very temporary character.

There has been, perhaps, a slight improvement in general enquiry during October, but business has been difficult to adjust, owing to a spreading nervousness as to the financial condition of trade and the complications which may follow should the critical position between Russia and Japan result in war.

**Market Rates for Products.***Tropical Agriculturist, 2nd November 1903.*

Cardamoms	...	... per lb.	1s. 6d. to 1s. 7d.
Croton seeds	...	... „ cwt.	15s. to 22s. 6d.
Cutch	...	... „ „	22s. 6d. to 30s.
Gum Arabic	...	... „ „	15s. to 20s.
Do. Kino	...	... „ lb.	4d. to 5d.
India-rubber, Assam	...	... „ „	2s. 3d. to 3s. 7½d.
Do. Burma	...	... „ „	2s. 3d. to 3s. 7½d.
Myrabolams, Madras	...	... „ cwt.	5s. to 6s. nom.
Do. Bombay	...	... „ „	4s. to 7s. 6d.
Do. Jubbulpore	...	... „ „	4s. to 5s. 6d.
Do. Calcutta	...	... „ „	3s. 6d. to 5s. nom.
Nux Vomica	...	... „ „	7s. to 10s.
Oil, Lemon grass	...	... „ lb.	6d. to 6½d.
Orchella weed, Ceylon	...	... „ cwt.	10s. to 12s. 6d.
Sandalwood, logs	...	... „ ton	£15 to £30.
Do. Chips	...	... „ „	£4 to £8.
Seedlac	...	... „ cwt.	117s. 6d. to 135s.
Tamarinds, Calcutta	...	... „ „	8s. to 12s.
Do. Madras	...	... „ „	4s. 6d. to 6s.





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## **Reproduction of Teak in Bamboo Forests in Lower Burma.**

BY H. C. WALKER, I.F.S.

As we are now extracting a large number of seed-bearing teak trees there must be a decrease of reproduction ; and since it is desired not only to maintain but to increase the future outturn of teak, natural regeneration should be aided very considerably artificially.

The works carried out for this purpose are :—

- (1) Taungya plantations.
- (2) Wathon plantations.
- (3) Improvement fellings.

The largest sums of money are spent on the first of these works. There are, however, several objections to be urged against taungya plantations.

Firstly, the growing stock has to be sacrificed. Secondly, it is generally thought that plantations, by offering a concentrated food supply, are responsible for the increase of *Hyblæa pueri* and that they form, therefore, centres of contagion. Having full access to the light, a seedling in a plantation is able to offer great resistance to this pest, and a second crop of leaves is usually put out to replace the ones destroyed ; but the pest is not confined to plantations, and it is possible that naturally-grown seedlings, being handicapped by their struggles for existence with other species, suffer very greatly.

These operations are very intense and involve considerable labour.

The following are the works usually carried out. Selection of a site, supervision while firing, counting numbers of seedlings, weeding twice in the 1st year, and once in the 2nd and 4th years, cleanings in the 6th, 8th and 10th years, thinnings every 10 years till maturity.

Owing to the labour involved the area is insignificant as compared with the area other than plantations in a division, but often exceeds in size that of a German division. The works are somewhat similar but are considerably more difficult, owing to the fact that the growth of weeds is very rapid, and particularly

owing to the fact that these plantations are very scattered and great loss of time is caused in travelling. It follows therefore that areas other than plantations are greatly neglected (as is proved by the figures in annual reports).

The method of taungya plantations is well suited for exotics or trees not naturally suited to the locality, but not, I think, for a tree like teak, which is capable, if grown under suitable conditions, of competing successfully with its numerous rivals. In a taungya plantation, however, we create artificially conditions unsuited to teak, as is proved by the fact that without weeding no seedlings survive.

Teak, however, is indigenous in Burma, and seedlings spring up naturally in great profusion, and without subsequent tending a large number reach maturity. It is clear therefore that by imitating nature reproduction can be increased at a small cost, and if so, it is opposed to sound economic principles to establish teak in such an elaborate and expensive manner as plantations.

The other two methods of reproduction are based on theories of natural regeneration. As far as I can gather there are three principal theories.

What I think may be called the official theory (although contradictory or illogical statements often occur in official documents) is that natural regeneration of teak corresponds with the flowering of bamboo.

This theory implies that teak cannot bear the shade of bamboos. In the case of Kyathaungwa jungle (*Bambusa polymorpha*) which only flowers once or twice a century, it must be assumed that natural regeneration of teak must be very dense, since the annual waste in the older age classes must be made good only after periods of 50 or 100 years. Similarly, regeneration of Kyathaung must be dense in order that it must re-establish itself in the same proportion as before. As soon as the cover of bamboo is removed, the year after flowering both seedlings of teak and bamboo must be supposed to spring up together, and it is therefore an essential feature of this theory that it must be assumed that the former is of faster growth than, and able to compete very successfully with the latter.

In Prome division, however, I had the opportunity of seeing several wathon plantations in areas where Myinwa, (*Dendrocalamus strictus*) had flowered gregariously. In forming these plantations the operations were considerably more elaborate than was necessary if what I have stated must be assumed is correct.

I found however that the bamboo seedlings grew faster than, and killed out the teak, unless very heavy weeding was made, and I found that in the older plantations had almost entirely killed out the teak.

If my statements are correct (and they can easily be verified) this theory of teak regeneration is incorrect.

All the objections I have urged against taungya plantations apply equally to wathon plantations, and also, as the formation is made by departmental agency, the work is more expensive. As teak is associated with the gregariously flowering Kyathaung over large tracts of country, the correctness or otherwise of this theory is of great importance. The theory is easy of verification, as it is only necessary to ascertain that in Kyathaung areas no reproduction has taken place since 1850 (or whatever may be the exact date of the last general flowering) and if, as is maintained, teak is found in clearly defined age-stages, the information can be obtained of the exact dates when this bamboo flowered during the last 200-300 years by counting the annual rings on teak stumps.

Although wathon plantations are not classed as experiments, yet at the same time, data for a cut and dried scheme for establishing teak when the Kyathaung flowers do not appear to have been collected, and also although it is the intention of the Forest Department to spend numerous lakhs of rupees on these operations, the above mentioned theory has not been verified.

This does not seem to me to be in accordance with sound economic principles.

There is a variety of this theory that bamboos should be cut just before the seed ripens. To cut bamboos is, however, expensive, as the cutting of one clump of bamboo such as Kyathaung is a day's work for a cooly (i.e., eight annas), and cannot be done on a large scale owing to the labour difficulty and the small size of the staff for supervision. There are other obvious objections to this theory.

The second theory, which is, however, not very popular, is that teak can stand a limited amount of shade and springs up under the bamboo, but owing to its sensitiveness to friction, is unable to pierce the canopy, and therefore remains stationary until the bamboo flowers and dies, and that when this occurs the advance growth of teak, having a considerable start, is able to keep above the bamboo seedlings. There are several obvious objections to this theory, and no methods are based on it.

The first theory is based on the idea that teak can stand no shade; the second that it can stand a little shade but no friction; there remains therefore the theory that teak can stand a limited amount of shade and friction. This latter theory is becoming more popular, and even in official writings it may be seen that some officers believe that improvement fellings in bamboo forests aid natural regeneration of teak.

I must own that my experience is very limited, but from what I have seen of the teak forests of Lower Burma, this latter theory seems to me to be most probably correct. My idea of the life-history of teak is somewhat as follows:—

That where there is no shade whatever a teak seedling is usually unable to compete with grasses and other vegetation

which benefit to a greater extent than teak from the light, as may be seen in any poongzoi. On the other hand, teak is somewhat of a light demander and cannot stand much shade, but that its maximum power of competing with its rivals is attained with a degree of light and shade between these two extremes; that the greatest amount of natural regeneration of teak is effected when bamboos have reached the permanent and stationary state of maturity, and not immediately after flowering or when they have not completed their maximum height growth. That teak seedlings spring up in places where the shade is less dense than usual, in gaps in the bamboo, etc. That as the most penetrable point of a bamboo canopy is where they bend over and form as it were a dome, and as also most light is let on to the ground immediately under this point, which is in most cases equidistant from the bases of the neighbouring clumps, this is the spot on which a teak seedling has the most chance of springing up and reaching maturity, but that it sometimes happens that a teak seedling grows to one side of the most penetrable spot, in which case the leading shoot is often suppressed or killed by friction; but that sometimes a side branch takes its place and pierces through the canopy, and that this occurrence causes a kink in the bole. The main principles on which I think methods for aiding reproduction in this class of forest should be based are, that seed should be sown in every place where a seedling would have a chance of success, and secondly that the number of such places should be artificially increased.

These forests are, however, pretty well covered with vegetation, and supposing my ideas were correct, not many seeds per acre could be sown. In the first place there is only room for one seedling between each group of bamboos at a spot under the centre of each dome, but such spots are distant from each other about 9 yards, so that at the most only 60 seedlings could be planted or sown per acre.

In the majority of these spots, however, the shade would be too great, so that only some 5 to 10 spots could be usefully sown up per acre.

As regards increasing the number of these spots, vegetation may be divided into two classes, bamboos and tree growth. It is often held that when bamboos are cut more numerous shoots are sent out but of inferior height growth, with the consequence that the shade is increased. It is also held that bamboo cutters improve teak reproduction. These beliefs are contradictory. Bamboo cutters, however, never cut new shoots but only old ones and prefer the outer ones. A new shoot invariably goes straight up, and the culms which die are, I think, always those that bend over most, or, in other words, overhanging is a sign of old age. If this is the case I think it is possible that a few of the culms which overhang most might be cut away in order to lessen the shade without affecting the quantity or quality of the new shoots.

in the same way that lopping an old branch has not the same effect as pruning a small branch.

A tall dense bamboo like *Kyathaung* takes up a great amount of space and naturally tends to cause timber trees to be far apart. It is, however, by no means a shade bearer, and a large tree by its shade tends to make the bamboo canopy more open. When, therefore, such a tree falls or is felled, a considerable amount of light is let on to the ground. It is after such an occurrence that, in my opinion, most teak is regenerated naturally, and by felling large inferior species of trees and sowing seed in the gaps thus formed, much good would, I think, be done.

It will be seen therefore that I am in favour of "improvement fellings combined with dibblings" on a large scale. This is by no means an original method of my own, as it was advocated in the early days when forestry was first taken up in Burma. It has, however, not yet been brought to a high pitch of perfection, and there is one strong objection to it, namely that many if not the majority of eminent foresters who have studied the matter carefully, hold theories entirely opposed to this method.

Trained officers have been studying these forests for nearly 50 years, and it may be thought that a great mass of information concerning the reproduction of teak had been collected and was at the disposal of any one who was desirous of obtaining it. I have not found this to be the case, but on the contrary have found that senior officers hold views on the subject which appear to me to be contradictory although dealing with fundamental points.

Although the trees in Europe have been for a long time under observation, one is greatly struck by the number of experiments which are constantly being carried out, but although the reverse is the case in Burma, very few experiments seem to have been carried out.

Problems of light and shade as they affect tree growth require carefully recorded observation. On a typical sample plot, by measuring and recording rate and manner of growth, it is possible to form a better estimate than by studying the growth of a tree in the forest in mass, as to remember the difference in growth of individual seedlings or trees is a great tax on the memory, and observations are rendered more difficult owing to constant transfers to localities where the conditions of the locality may differ.

If, therefore, our knowledge of the reproduction of teak is as limited as seems to me to be the case, the remedy would be, I think, to carry out systematic and recorded observations and experiments.

As I have been finding great difficulty in discovering what facts may be taken as established, I venture to hope that some officer of experience will oblige me by giving me some information on this subject.

### "Spike" Disease among Sandal Trees.

BY M. RAMA RAO, MADRAS FOREST DEPARTMENT.

I HAVE read with considerable interest all the articles that have appeared in the *Indian Forester* on the above subject. I have also read Mr. Muttannah's notes, dated 26th March, 3rd and 16th May, 1903, his letter dated 12th May to Dr. Butler, and Dr. Butler's reply thereto, dated 3rd June 1903.

2. Although Mr. McCarthy was the first to bring to notice the existence of this disease, his memorandum on the subject has not appeared in the *Indian Forester*, and I have therefore missed a perusal of it.

3. The following are the salient features of the disease observed by the several writers on the subject. They are as follows:—

(1) The spike is found only in those sandal tracts of Coorg and the adjoining Mysore districts that have been invaded by lantana.

(2) It has not been observed outside the lantana region, nor even in the lantana covered tracts of the Hassan and Shimoga districts.

(3) The main symptoms of the disease are (i) *externally* "an increased vegetative activity and a failure to form flowers," (ii) *internally* "an excessive production of starch, together with certain structural alterations in the tissues."

(4) The disease may appear in all parts of a tree, or only in certain parts of it, even in a single branch, while the other parts of the tree may remain normal and healthy.

(5) It is communicable from tree to tree according to Mr. Barber and Dr. Butler, but whether it is contagious or infectious or both has not been definitely stated or affirmed by them.

(6) Microscopical examination of the affected trees, conducted by these two gentlemen, has not revealed the existence of any parasites or fungi sufficient to account for the disease.

(7) Dr. Butler suspects circulation of some poison in the sap as a probable cause of the disease, while Mr. Barber thinks that the origin of the disease is in some way connected with the death of the root-ends and sucking organs (haustoria) of the sandal.

(8) In the midst of spike-affected tracts, healthy trees are not uncommon, where sandal is associated with other species of plants with or without lantana.

(4) Mr. Muttannah thinks that the disease is neither contagious nor infectious, and that it may be due to (a) old age, (b) injury to roots by fires or hurt, (c) suppression or strangulation by climbers, and (d) fungoid, parasitic or epiphytic growth. Since the investigations of Mr. Barber and Dr. Butler have proved the absence of cause (d), it may be eliminated. As regards the other three causes, I think they, too, do not account for the disease at all, for all of them do exist as they have existed for

long in the sandal tracts of the Salem district, where we do not come across spiked sandal trees at all.

5. I have been of late devoting attention to the study of the root-system of the sandal. The result of my study is in entire accord with the observations of Mr. Barber, in respect of the important part that its root parasitism plays in the economy and development of this tree. The sandal is admittedly a surface feeder, its tap-root rarely ever extending beyond a depth of 5 feet or its lateral roots beyond a few inches of the surface. This characteristic is probably the outcome of its roots attaching themselves to the roots of other plants. It is very sparing in producing root hairs and root fibres, as compared with other species, and this paucity of such root appendages, so essential and abundant in the case of non-parasitic plants for the absorption of nourishment directly from the soil, is probably also another resultant of its root-parasitic habit. My observations have led me to believe strongly that the sandal depends almost entirely on the roots of its neighbours for its nourishment. If, therefore, those neighbours are also surface-rooted like itself, any injury to their roots by drought, fires or other causes may retard or disable them from performing their functions properly, and this must tell seriously on the growth of their guest, the sandal. On the other hand, if the hosts are deep-rooted species, the sandal will continue to thrive, or at any rate to keep itself alive in spite of drought or other injurious causes, because its deep-rooted hosts are not so easily affected by such causes, and will therefore furnish the nourishment it requires.

6. Now, the lantana is a comparatively low shrub with a superficial root system. Its rapid and gregarious growth, forming an impenetrable thicket over extensive tracts, generally prevents other species growing under its cover except isolated plants which have outgrown it. Mr. Barber has found the sandal forming root connections with the lantana and drawing its nourishment therefrom. Owing to the absence of other species, as generally happens in the lantana-invaded tracts, the sandal has to depend solely on the latter, attacking its roots in such a way that they become, in course of time, vitiated or even exhausted. When this stage is reached, the root-ends and haustoria of sandal, by which it is connected with the roots of the lantana, die also, and the supply of nourishment, including water to the sandal, is cut off. But the process of assimilation by its leaves continues until the reserve materials in its crown are used up and exhausted. Owing to the deprivation of the necessary mineral ingredients and water, the starch formed by assimilation cannot become converted into growing materials in its tissues, and it, therefore, remains in the cells of the leaves, etc. in large quantities; hence the superabundance of starch, as is explained in para 23 of Mr. Barber's report. As observed in para 27 of the same report, when the root-ends of the sandal die, fresh adventitious roots are rarely ever formed



from the older parts of the root system. This I have observed in the roots of even healthy trees. The exhaustion and decay of the roots of the *lantana* and of the root-ends of the sandal are greatly accentuated by fires, which must affect the surface roots of both the species.

7. May not the foregoing remarks explain the real origin of the spike disease, or at any rate afford a right clue to the solution of the mystery.

8. It will doubtless be asked, as indeed I have already been asked by a friend, how this explanation will solve the problem of the existence of healthy sandal trees in the midst of spike-affected areas, and of the absence of spike disease in the *lantana* tracts of the Hassan and Shimoga districts. Not having seen these tracts myself, I cannot venture to give a direct answer to this question, but I shall put forward a suggestion, in the hope that it may induce those concerned to make a careful inspection of the localities and to verify the correctness or otherwise of the view that I have ventured to submit. The sandal sends out its roots far and wide, for they have been found at least a hundred feet from its base. Some of its congeners (hosts) also send their roots over long distances. Thus, for instance, I have seen a root of a young *Albizia amara* extending to 50 ft. and covered with the unmistakable cushions formed by the sandal haustoria throughout its length; similarly, a small root of *Acacia coarctata* was covered with the cushions throughout its length of 22 feet. I could cite other instances, but these will suffice for the present purpose. At some distances from the healthy sandal trees in the tracts affected by the spike, there may be isolated trees and plants of other species with whose roots the roots of the healthy sandal may have formed root connection, but owing to the distant situation of such trees, this circumstance might escape an ordinary observer unacquainted with the root systems of these species. In such cases, the presence or absence of *lantana* does not affect the sandal, since the latter is independent of it, being furnished with its nourishment from the distant species. May not this be the case in respect of healthy sandal in the midst of affected tracts? If this surmise prove correct, then similar circumstances, perhaps on a larger scale, may explain the absence of spike disease in the *lantana* tracts of the Hassan and Shimoga districts. Besides, the sandal being a comparatively small-sized tree, the requirements of several trees in the matter of nourishment can easily be supplied by the roots of a single well grown host. I have myself seen at the Forest Office, Denkanicota, six sandal trees with girths varying from 25 to 18 inches, flourishing luxuriantly in the neighbourhood of only two *Inga dulcis* trees, both of which are about 2½ feet in girth at breast height.

9. Whether the above explanation sufficiently accounts for the existence of healthy trees in the midst of affected tracts is capable of easy verification by careful inspection of the localities

and by ascertaining whether there are any congeners of the sandal within easy reach of its roots, and if so, to what species of plant they belong, and whether their roots have been attacked by the sandal roots. I hope some Forest Officers in Mysore and Coorg, who have opportunities and facilities for investigating this subject, will furnish information on these points.

10. By way of testing the correctness or otherwise of this explanation, I think it will be interesting to plant quick-growing species, such as the *Inga dulcis*, *Albizia lebbek*, *A odoratissima*, *Acacia cæsia*, in the midst of the lantana areas in which the sandal is still too young to manifest spike, but where the older trees have already been affected by it, and then to watch the effect of the introduction of these species on the growth of the young sandal. If the sandal establishes root-connections with these new plants, as I have no doubt it will, and remains unaffected by the spike disease, then we shall have not only gained a true insight into the cause of the disease, but shall have also triumphed over it. The results of an experiment like this cannot be gauged without patiently waiting for a few years, but the enormous interest at stake justifies a trial.

11. I have found a sandal forming root connections with other plants such as grasses, herbs and small shrubs, at a very young age, even within a few months of its germination. As it advances in growth, it attacks roots of larger species. These observations go to confirm entirely what has been already recorded by Mr. Barber. With growth, its requirements also increase proportionately; and unless it finds suitable congeners capable of supplying its wants, it languishes, grows stunted and sickly, with its leaves gradually diminishing in size and turning yellow. This accounts for the stunted and sickly appearance of sandal trees in low open scrub on dry stony soils. The failure of sandal plantations in Coorg, Mysore and the Madras Presidency is probably attributable to the same causes. The largest sandal trees on the Salem Javadi are generally found on fairly deep rich soils, with or without stones, and in the company of other species such as *Albizia odoratissima*, *Albizia amara*, *Atlantia monophylla*, *Limonia acidissima*, *Premna tomentosa*, *Zizyphus xylopyra*, *Z. ænoplia*, *Polyalthias*, *Unonas*, *Carissa carandas*, *Acacia cæsia*, *Acacia pennata*, amongst other species, with almost all of which the sandal forms root-connection, and to this circumstance, more than any other, I attribute the vigorous and healthy growth.

12. If I have understood Dr. Butler and Mr. Barber correctly, they have based their opinion that the spike is a contagious or infectious disease, or at any rate that it is communicable from tree to tree by their roots, on the main circumstance that the first invasion of the disease was sudden and extended rapidly over a large tract. May not this be explained by the area thus suddenly affected being completely under the lantana, to the exclusion probably of all other species, and when the roots of the lantana all over the

area and within reach of the sandal roots had been attacked and rendered unfit to furnish nourishment to the sandal, this circumstance being aggravated by fires, the supply of nourishment to the sandal was suddenly cut off and hence resulted the sudden and rapid appearance of the spike over an extensive tract.

13. I have ventured to record the foregoing ideas without any pretensions to have solved the problem which has so far baffled specialists like Dr Butler and Mr. Barber and observers like Mr. Muttannah and Mr. McCarthy, but in the simple hope that they may give a clue to the causes of the spike disease; on the other hand, if they be proved erroneous, I shall be glad to know it.

### Plains Forests and Underground Waters.

(Observations made in the Forest of Mondon (Meurthe and Moselle))

THE above is the name of an article in the *Revue des Eaux et Forêts* (March and April numbers, 1903,) by M. E. Henri, the celebrated Nancy professor, and the greater part is here roughly translated for the benefit of such readers of the *Indian Forester* as have not the opportunity of seeing it in the original French. It is an example of the really scientific way they study forest problems in foreign countries. In India we do but little to place our work on a scientific basis, and therefore render ourselves liable to the gravest mistakes with very far-reaching consequences. If perchance some individual forester works at a forest problem in the midst of his ordinary multifarious duties, as likely as not the results remain unknown to the bulk of the department. As a rule his ordinary work is as much as an energetic officer can manage. Nor is it sufficient that we in India should sit and wait for the result arrived at by foreign research bureaux, since facts which apply in Europe or America may not apply in India, where the climatic conditions are so vastly different, as M. Henri remarks in a note to this very article, which we will now proceed to translate.

In March 1897, I received from M. Ototsky, Conservator of the Mineralogical Museum of the University of St. Petersburg, a very interesting work giving the results of the hydrological researches made in 1895 in the steppe forests of Southern Russia by the *Société Libre Impériale Economique*, which placed the direction of these researches in M. Ototsky's hands.

These researches are connected with the extensive enquiry that the Russians are at the present time making into the reason for the fall in the level of streams in their country and the greater frequency of years of drought which lead to such terrible famines. The Forest Department is, for its part, organising hydrological tours into the regions where the drying up of the climate and the diminution of running waters have been most complained of. One realises of what capital importance enquiry into the causes of these phenomena is in European Russia, where the rainfall is small

and often insufficient for the satisfactory growth of crops, especially beet and cereals; the rainfall in fact only varies, according to regions and years, between 20 and 60 centimetres, while the Caspian steppes do not even receive 20 centimetres in the year.

NOTE.—The maximum annual rainfall of Russia (60 centimetres) corresponds to the minimum of France, where it is from 60 to 80 centimetres.

The numerous borings made in the forest of Chipoff (in the Government of Voronej) and in the Black Forest in the Government of Kherson, both on the southern border of the region which in Russia is called the forest-clad steppe, have enabled M. Ototsky to formulate the following dictum, which I quote *verbatim* :—

The results of all the observations made in the steppe forests of Southern Russia are as follows :—*All physico-geographical conditions being equal, the level of phreatic waters in the forests of the steppe zone is lower than in the adjacent steppe or than, speaking generally, in a neighbouring open space.*

The depression of the level is more marked under old than under young forest crops.

Borings made during the season of growth (1st June to 1st September) both inside and outside the forest of Chipoff, show that the water level inside is some ten metres lower than outside, and similarly, in the Black Forest the difference is some four or five metres.

Presumably these figures are maxima, which are only rarely attained, because firstly the boring took place at the moment when the forest is transpiring most, that is, at the moment when it draws the greatest quantity of water from the soil, and secondly, because the experiments were made at places where the annual rainfall is only 30 centimetres, where natural forests are nearly completely wanting, in great part by reason of the lack of water, and where, being nearly always very thirsty, they greedily utilise for their needs of transpiration the meagre provision of water to be obtained from the atmosphere.

The Society desired to study the influence of forests on underground waters in other conditions of soil and climate. In 1897 observations were made again under the direction of M. Ototsky further north in latitude 60°, the former experiments having been made some 10 degrees further south. The bore holes were sunk in the forests of Ondielnaia and of Paylosk in the Government of St. Petersburg, where the climate is colder and damper, the rainfall greater and underground waters more abundant. These were fir forests instead of deciduous forests, as at Voronej and Kherson. Here, again, great care was taken to locate the borings in as similar physico-geographical conditions as possible, that is to say on flat ground (of moraine origin) formed of layers of miné-

\*This is the term used by Daubree to represent the layer of underground waters nearest the surface which feeds ordinary wells. It seems untranslatable into English. —*Transl.*

ral soil of the same composition and parallel strata, where the level of phreatic waters was motionless.

M. Ototsky came to the following conclusions:—

“In spite of new physico-geographical and climatic conditions (abundant subterranean water close to the surface, a cold and very damp climate, trees with superficial [*fragantes*] roots, etc.) in the forests of northern Russia, I found the same fact as in the steppes *viz.*—*throughout the forests that were studied the first layer (horizon) of underground waters is lower than in the neighbouring open country.* This fact was particularly marked in the forest of Ondielnaïa, where underground water was entirely absent. But as a rule, for reasons easily understood, the influence of the northern forests is weaker than in the steppe forests. The difference in level is not more than 0.5 to 1.15 metre, according to the forest.”

These results were so much in opposition to the ruling idea that it was urgent to verify them and to see whether different climatic conditions, especially a very much higher rainfall, would modify or reverse the results obtained in Russia.

In July 1899 M. Daubree, Director-General of Forests, sanctioned at my request, a grant of money to enable the Forest School (of Nancy) to experiment on the influence of forests on underground waters in the N.-E. of France, where the rainfall is three times as heavy as in the Governments of Voronej and Kherson.

*Situation*:—The Government forest of Mondon, near Luneville (Meurthe and Moselle) was chosen for the observations, because it realises most of the requisite conditions. The forest is easily reached, and lies between the rivers Meurthe and Vezouze, being about 2,000 hectares in extent at from 246 to 266 metres above the sea. The nearly level soil is alluvium and is not anywhere more than 30 metres above the river.

*Soil*:—The soil consists of sand, gravel and pebbles of very unequal size. At the surface it is generally fine sand, red, grey or white; sometimes it is so fine as to resemble a clay soil by its faculty of imbibition; beneath comes the gravel, and then the pebble (quartzite of milky quartz), the soil ever growing damper as the water bearing layer is approached, and the layer not being much more than 5 metres down.

From a boring made on the south border of the forest the impermeable layer upon which the underground sheet of water was supported was found to be 7 metres below the surface.

*Climatic*:—The most important element from our present point of view is rainfall. The depth of the rain water (*lame d'eau*) which fell on the forest was 713 millimetres in 1900 and 891 in 1901, as shown by a meteorological station at 3 kilometres to the north of the centre of the borings which were taken (see below). In an average year the rainfall is greater from June to December than in the first five months of the year, the measurements (*franche pluviale*) rising to 5 decimetres in the summer and autumn (June

to November) and falling to 3 decimetres in the winter and spring (December to May). The total number of rainy days is 160 to 170.

The mean temperature is  $9^{\circ}4$  C. ; for the winter  $1^{\circ}43$  C. ; for the spring  $9^{\circ}05$  C. ; for the summer  $17^{\circ}7$  C. ; and for the autumn  $9^{\circ}42$  C.

Ten boreholes of 0.05 metre diameter were made with a Belgian geological borer from the spring of 1900 onwards, and tubes of zinc, pierced with small holes and with a similarly pierced cone at the end, were driven in, so that earth could not fall in. The numerous small holes in the tubes easily allowed the water to find its level. Five borings were sunk in open ground, in the areas cleared for the use of the Forest Guards, or in nurseries, or village grazing grounds, but always near the forest, the furthest being no more than 100 metres off. Five other borings, to be compared with the first five, were sunk in the neighbouring forest as near and in conditions as comparable as was practicable. There were thus five pairs of borings, but one pair was spoilt and abandoned. Observations were made once a month from the 4th May 1900 to the 24th August 1904.

*Depth to the subterranean water in the four pairs of borings.*  
(The letter *h* means the elevation).

Dates.	No. 1, open ground (field). <i>h</i> = 243.77 metres.	No. 1 bis. — Wooded ground old coppice. <i>h</i> = 244.68 metres.	No. 2, open ground (nursery of 24 ares). <i>h</i> = 244.63 metres.	No. 2 bis. — Wooded ground old coppice. <i>h</i> = 245 metres.	No. 3, open ground (field). <i>h</i> = 257.67 metres.	No. 3 bis. — Wooded ground old coppice. <i>h</i> = 258.87 metres.	No. 4, open ground, grazing land. <i>h</i> = 247.46.	No. 4 bis. — Wooded ground Scots pine. <i>h</i> = 246 metres.
	Metres.	Metres.	Metres.	Metres.	Metres.	Metres.	Metres.	
4-5-1900	2.12	3.31	3.45	...	...	...	2.43	1.30
17-6	2.35	3.40	3.65	...	...	...	2.65	1.22
13-7	2.55	3.50	3.93	...	...	...	2.90	1.44
16-8	2.70	3.72	4.53	4.89	...	...	...	...
20-9	2.90	3.90	4.95	5.30	...	5.25	3.30	1.68
12-10	3.08	4.00	5.00	5.15	3.72	5.32	3.37	1.73
17-11	3.18	4.10	5.10	5.20	3.75	5.35	3.40	1.76
18-12	3.12	4.20	4.60	5.17	3.66	5.29	2.90	1.60
15-1-1901	3.20	4.25	4.85	5.22	3.75	5.20	3.00	1.54
21-2	3.16	4.25	4.75	5.18	3.58	4.96	borings buried by snow.	
18-3	3.05	4.17	3.85	5.18	2.71	4.36	1.89	0.27
18-4	2.13	3.65	3.27	4.27	2.39	4.18	1.65	0.28
14-5	2.28	3.35	3.37	4.09	2.62	4.22	2.23	0.86

Note.—The figures underlined with a full line show the highest level; those underlined with a dotted line the lowest.

Depth to the subterranean water in the four pairs of borings—(concluded).

Date.	No. 1, open ground (field). h = 243.77 metres.	No. 1 bis.—Wooded ground—old coppice. h = 244.58 metres.	No. 2, open ground (nursery of 24 ares). h = 244.53 metres.	No. 2 bis.—Wooded ground old coppice. h = 245 metres.	No. 3, open ground (field). h = 257.67 metres.	No. 3 bis.—Wooded ground old coppice. h = 258.81 metres.	No. 4, open ground, grassland. h = 247.46 metres.	No. 4 bis.—Wooded ground Scots pine. h = 246 metres.
23-6-1901	2.53	3.58	3.73	4.38	2.85	4.54	2.61	1.23
17-7	2.64	3.70	4.00	4.64	3.20	4.80	2.88	1.50
20-8	2.82	3.90	4.47	4.95	3.35	4.99	2.87	1.52
21-9	2.69	3.98	3.84	5.07	3.07	4.85	2.11	1.06
21-10	2.75	4.02	4.06	5.05	2.97	4.75	2.05	0.85
21-11	2.73	3.96	4.29	5.00	3.07	4.49	2.03	0.74
21-12	2.67	3.85	4.15	4.98	2.80	4.42	1.80	0.52
27-1-1902	2.28	3.72	3.73	4.62	2.53	4.08	0.88	0.37
25-2	2.03	3.28	3.32	4.07	2.19	3.70	0.80	0.27
26-3	2.13	3.25	3.41	4.93	2.91	3.60	0.22	0.35
28-4	1.99	3.25	3.30	3.96	1.95	3.48	1.27	0.52
21-5	1.85	3.23	3.22	3.93	1.72	3.36	0.13	0.20
21-6	2.19	3.25	3.63	3.98	1.81	3.54	1.50	0.65
22-7	2.66	3.49	3.68	4.30	2.35	4.15	2.54	1.20
24-8	2.71	3.67	4.12	4.64	2.80	4.62	2.89	1.49
Mean for the 28 * months.	2.59	3.69	4.06	4.69	2.82	4.44	2.16	1.01
And taking account of the difference in elevation of the orifices in each pair of borings, the mean becomes.	+1.10	+0.63	+0.63	+1.62	+1.62	+1.62	+1.15	+1.15
Under forest the level is lower by maximum difference.	3.39	3.69	4.49	4.69	4.02	4.44	2.16	2.47
	+0.30	+0.20	+0.20	+0.42	+0.42	+0.42	+0.31	+0.31
	1.35	1.05	1.73	1.27	2.03	2.03	3.27	1.56

\* Note.—From this point to the end of the table it is not understood how the figures were arrived at. Apparently they should be as follows:—

2.59	3.71	4.01	4.73	2.86	4.47	2.16	1.01
+1.12	+0.72	+1.61	+1.61	+1.61	+1.61	+1.15	+1.15
3.40	3.71	4.48	4.73	4.16	4.47	2.16	2.47
+0.31	+0.25	+0.31	+0.31	+0.31	+0.31	+0.31	+0.31
1.35	1.02	1.88	1.34	2.03	2.00	3.27	1.56

## DISTANCES AND ELEVATION OF THE BORINGS.

**1st Pair.**—No. 1 in the centre of a square of about 8 hectares, cleared of forest for the fields of a Ranger and a Forest Guard living at a forest house and No. 1 bis. about 300 metres distant from No. 1, in a coppice coupe with a considerable number of standards. The difference in elevation being 0.81 metre, which must be added to No. 1 if it is desired to reduce the two borings to one plane.

**2nd Pair.**—It comprises the boring No. 2 represented by the well, which is in a small nursery of 24 ares in extent and No. 2 bis. in a 50-year-old coppice at about 100 metres from the well its orifice is 0.47 metre higher than that of the well. No. 2 bis. is only about 20 metres outside the forest. In spite of the smallness of this open place the absence of forest growth already affects the water level, more, even, than the table would appear to show. It is a known fact that round a well the layer of water is bent, the well exercising a sort of suction. The true level is higher than the surface of the water in the well, of which we have only measured the variation. It is doubtless for this reason that the difference in level (*denivellation*) is less here than in other pairs of borings.

**3rd Pair.**—No. 3 in the centre of an area about one hectare in extent, being the open ground near a Forest Guard's house and No. 3 bis. in a coppice of 30 to 35 years age with a considerable number of standards. The distance apart was 900 metres; the difference in elevation 1.30 metres.

**4th Pair.**—No. 4 in uncultivated grazing land, higher by 1.46 metres than No. 4 bis. and 650 metres from it. No. 4 bis. was in very thick sapling forest 30 years old, consisting almost entirely of Scots pine. The soil was covered with a thick layer of needles, more or less decomposed.

The tubes are still in the ground, so that should there be any cases of extraordinary climatic conditions it will be possible, and may be very useful, to take measurements again.

(To be continued.)

## II.—CORRESPONDENCE.

## On Certain Important Forest Questions.

THE article by Mr. Gamble under the above title, in the November number of the *Forester*, is one which the reputation of the author and the subjects discussed combine to make of the utmost interest to all Indian Forest Officers, while the same considerations naturally expose to the charge of presumption any insignificant unit of our great Department, of short service and "of no reputation," who may give his opinion on the article or on any part thereof.

I venture, however, to send the following few remarks on the "Botany" question. Taking as his text the words, "Sir Dietrich says that many English botanists hold the opinion



that a good botanist must necessarily be a good Forester" Mr. Gamble, in the space of three paragraphs, works himself into such a state of fervour that he accuses Sir Dietrich Brandis of thinking "that the solution of the problems of silviculture and of forest management, in a practical manner, can be effected without a good acquaintance with the individual species which make up the forest." Anyone who has the smallest acquaintance with the Department, or with the work of Sir Dietrich, of course knows that this is preposterous, and Mr. Gamble, we all feel sure, cannot have intended to convey the impression that he thought otherwise.

The word *botany*, in conjunction with that of *forestry*, has given rise to a great deal of discussion in the *Forester* in the past, and appears calculated to cause a good deal more. In the present case, everything apparently turns on the definition of the word *botanist*, and it seems a matter for regret that a mere hair-splitting question of names should give rise to such controversy.

To the majority of the uninitiated Forest Officers, a *botanist* would mean a *specialist in botany*. Mr. Gamble tells us that he considers a botanist "one who keeps up his Forest School teaching in after times, who, if he met with a tree he does not know, can successfully use a *Flora* and with it find out what use it is and how it is to be treated, who understands well the main principles of plant physiology." Surely this definition would not be accepted by the authorities at Kew, or by Sir George King for example. Would these not consider such a definition as describing not a *botanist*, but possibly one with a *taste for botany*, in somewhat the same way as the botanical professor, with an established scientific reputation, would regard the "man in the street with the collecting tin," whose botanical qualification might possibly be held sufficient for him to satisfactorily teach ladies systematic botany. In any case, whether Mr. Gamble's definition is right or wrong in the abstract, does not concern us, the point being whether Sir Dietrich was correct in his opinion as to the meaning which the word *botanist* would convey to the majority of men generally held to be Foresters or Botanists. Most of us will, I think, agree that he was.

Again, the word *botany* is undoubtedly often used in the restricted sense of *systematic botany*, and there are, I think, not many who would be inclined to say that a man whose hobby is not systematic botany cannot still be at home in the forests or know the trees he has to deal with and their value economically and silviculturally. In many ways the knowledge of the trees possessed by the forester who passes his time among the trees, who watches them develop and grow from the tiny seedling to the giant of the forest, to whom the plant life and great struggle for existence in the forests of his charge are always of the utmost interest and importance, is far more perfect than that

possessed by the pale and studious systematic botanist, in his stuffy herbarium, with his microscope and surrounded by the dead and mutilated fragments of the trees. It is surely a great mistake to think that a man who does not know the scientific name of a tree, does not in consequence know anything about that tree.

In the first place we have our vernacular names, which personally I have always found of the greatest use in the Central Provinces, and which Sir Dietrich himself tells us "have a fixity which systematic names do not yet possess."

Secondly, there are many characters which are little if at all known to the systematic botanist, or which, if known, are considered of very little importance by him, but which help the forester to recognize his trees, and which are usually far more important to him in his work than are the minute characters on which the systematic botanist so largely depends. When marking for a felling in high forest the trees whose crowns are perhaps 60 to 100 feet from the ground, the forester must be able to recognize his species without the aid of flowers or fruit or even of minute characters of the leaves. Again, in getting an idea of the composition of a crop, on a distant hillside, the forester cannot bring to his aid the often microscopic characters of the *Floras*. The colour and characters of the bark, the shape of the stem and crown, the arrangement of the branches, the time of shedding and putting out foliage, the colours of the leaves at different seasons, and many others are all characters of the greatest practical use to the forester, but which are of very small account in the opinion of the systematic botanist. Again, botanical specialists are always at hand and if, at any time, we wish to label one of our old friends with the unwieldy name fixed, and if necessary subsequently altered, according to the more or less arbitrary dictates of systematic botany, we have only to send specimens of leaf, flower and fruit to Calcutta, or if necessary, to Kew, and the christening is soon accomplished.

Taking *botanist*, then, in the narrow sense of a *specialist in systematic botany*, it is obvious that no forester "need lose the prestige of being a scientific man" because he is not a botanist, more particularly since the recent election of Dr. Schlich as a Fellow of the Royal Society gives the forester an assured position as a scientific man, in virtue of his being a forester alone. At the same time, no one can of course be a specialist in forestry unless he possesses a certain knowledge of the allied science of botany, and as Sir Dietrich says, botany (which we may consider in the widest sense or as including systematic botany only) is a "most useful help" towards efficiency in forestry.

After all, however, Mr. Gamble fully admits this, and, with the exception of the question as to the exact definition of the term *botanist*, there appears to be no difference between the opinions expressed by Sir Dietrich and Mr. Gamble on this

botany question, for the latter sums up by stating that "forestry, itself I maintain a scientific subject, cannot do without the aid of botany and other allied sciences," and this none of us, and far less Sir Dietrich, would, I think, dream of disputing. Let us all hope then that in forestry, when there is no disagreement regarding main principles, no dissension or ill-will may be created through the splitting of hairs over the precise meaning of words—a state of things which, in religion at least, has often done so much harm.

R. S. HOLE, F.C.H. F.E.S.

### **A Protest from the Malay States.**

WITH reference to Mr. Gamble's article on "Certain important forest questions" in the *Indian Forester* for November (No. 11) page 489, in which he discusses the qualifications of Burma as a training school in the preparation of Forest Officers for higher appointments, and makes certain statements affecting the nature of the works in Burma, I would ask to be allowed as a Burma Forest Officer of 13 years' standing to question some of those statements and state some facts. The writer is apparently ignorant of the actual state of affairs in Burma with regard to the more important works or has been misinformed.

Firstly, Mr. Gamble asks, "What works have been done in those reserves where taungyas are not cut and where the constant extraction of teak *must* be impoverishing the capital of the forest and encouraging the growth of the less valuable species." The general rule in Burma is that where no detailed working-plans have been drawn up for a reserve, no teak trees may be felled. A glance at the Review of Forest Administration in British India for 1901-1902 will show that 2,196 square miles are under sanctioned working-plans, and naturally those plans are so drawn up that far from impoverishing the forests they will be richer in teak at the end of the first period than they are now. My own experience of Burma embraces the Rangoon, Toungoo, Prome, Magwe and Minbu, Upper Chindwin and Pyinmana Divisions. In Rangoon and Magwe at that time there was no sanctioned working-plan, therefore no cutting of teak was permitted; in Prome working-plans were made for all the teak forests, and as I was in charge for three years and did girdling work myself, I can testify that if anything we are taking out less than the normal yield of teak. In Toungoo I was engaged on working-plans for one cold season, and I believe that at the present moment the field work for the whole of the Toungoo teak reserves (about 1,000 square miles) is now completed. In Tharrawaddy, as is well known, all the teak cut in reserves is girdled under a sanctioned working-plan, and the out-put, although very large, is regular and cannot diminish unless through difficulty of extraction.

I fail to see how teak "taungya" plantations affect the matter at all, as they will yield us no return within the next 100 years.

I feel sure that I am safe in saying that since the girdling of teak trees by Messrs. The Bombay Burma Trading Corporation, Limited, was put a stop to by Government, no girdling has been done such as would warrant the assertion that the teak forests are being impoverished. Such a statement would obviously reflect on the Burma Forest staff as well as on the Inspector-General of Forests. In all girdling of teak at the time I speak of, every tree in reserved forests was selected, measured and marked by an Assistant Conservator, or Extra Assistant Conservator of Forests, and on no account could the number laid down in the working-plan for girdling be exceeded.

In addition to this, special girdling proposals were sent in yearly to the Conservator as a double safeguard. As regards "the encouraging of less valuable species" mentioned by Mr. Gamble, a glance at the provision of any of the working-plans for Tharrawaddy, Toungoo, Prome, etc., will show that due provision is made for the execution of works of improvement, chiefly creeper cutting and freeing of young and suppressed teak trees by felling or ringing less valuable species. I had personally to inspect such works regularly, and in any compartment girdled over in any one year such works were carried out prior to girdling. The areas so treated are very large, exceeding in some divisions 5,000 acres per annum.

As regards the alleged falling off of teak supplied from Burma, this has obviously no connection with excessive cutting, at any rate for the last few years, seeing that forests for which no working-plans exist are closed to extraction, and that year by year as working-plans are drawn up more and more forest is opened up to systematic felling. The quantity of teak cut annually should therefore gradually increase. A falling off as compared with the out-put of some years ago is accounted for by the fact that the Bombay Burma leases have mostly lapsed, and that they have, as is well known, removed two-thirds or more of their employees and elephants to Siam. Reference to para. 31 of the Inspector-General's Review for 1901-1902 further explains the poor outturn for that year in Burma, *viz* :—"Unfavourable seasons, closing the waterways prematurely." I think I have said enough on this head to convince such as require convincing that this main principle of forestry is not being neglected in Burma, but if not I can only suggest a careful study of the subject and a tour through one or two Burma divisions.

I have only a few words to say as regards Mr. Gamble's opinion as expressed on pages 490 and 491, in which he evidently considers that a Burma Forest Officer's greatest object is the production of revenue, and that demarcation and other works are not given all the attention that is their due. I can assure him

that my own experience and that of the men of about my own length of service, besides many others, has been quite the contrary. To quote from personal experience, my first year in Burma was employed in demarcation and marking out of Cutch reserves. I had to demarcate practically all the forest reserves in Magwe sub-division, several hundred square miles reserves proposed a year or two earlier by Mr. C. W. A. Bruce. Knowing the Magwe forests as I now do, I can say they could not have been better chosen.

In the Upper Chindwin I was employed for two years on no other work. The first cold season on demarcation for two months and then survey and reserve proposals and settlements. In my second cold weather I spent five months choosing reserves in new country, and was able to send in proposals for 250 square miles of reserved forest with plane-tabled boundaries and valuation surveys. In Prome, which I afterwards held for three years, the work was such as a Forest Officer might almost consider ideal for teaching and learning forest work, and I will enumerate them and leave the reader to judge.

1. Regular girdling as per working-plans over about seven compartments annually, in area about 700—800 acres each.
2. Works of improvement in the same.
3. Fire protection over 100 square miles.
4. Teak taungya plantations.
5. Cutch do. do.
6. Thinnings of plantations.
7. Weeding of plantations.
8. Selection of new reserves (probable area 300 square miles).

And lastly, but also very important, the extraction of about 5,000 logs of teak annually by Government agency, necessitating the making of about 24 contracts with local Burmans, the handling of large sums of money in advances, and the portioning out of such areas as were available and had been girdled as per plans.

As regards forest protection, offences were extremely numerous and the amount of work in this line was very heavy.

I would here again draw attention to the remarks of the Inspector-General of Forests in his Report for 1901-1902.

Section II.—Forest Settlement.

„ III.—Demarcation.

„ IV.—Surveys, concluding para. (para 8).

„ V.—Working-plans (para. 10) Burma.

In every case the Inspector-General makes mention of the large amount of good work done, and I think his remarks carry, if possible, extra weight when it is remembered that he came straight from Burma to take up his officiating appointment. There is one point however on which I have great pleasure in endorsing the opinion of Mr. Gamble, and that is as regards buildings and communications, and here I must, on behalf of the average Forest Officer, disclaim all responsibility. It is not permissible to

criticise the powers that be, even if they have an undue lust for a large surplus, but I am sure that the Forest Officers of Burma would agree that more should be spent on roads and buildings, or rather bridle tracks and fords, as the area is too vast to attempt roads on a large scale. At the same time the expenditure on buildings for Burma in 1901-1902 was greater than that in any other province except one. The rivers of Burma will always be the main lines of transport for teak however, and money judiciously spent on their clearance is well spent.

It is for timbers such as Pyinkado that roads or tramways will be required.

In conclusion I may say that I am two years behind the time as regards actual experience in Burma, as I have been serving now for two years in the Federated Malay States and Straits Settlements, but I maintain that no finer all-round training ground for a forester can be found than *Burma*, provided experience is obtained both in Upper and Lower Burma.

I anticipate, Mr. Editor, that many more able defenders than myself will have arisen, but at any rate I have tried to give you my personal experience as a Burma Forest Officer. I believe it will stand as a fair average sample. Mr. Gamble has, at any rate, succeeded in arousing my sense of justice, and he alone must be held responsible for this long and perhaps wearisome history, much of it I fear my own personal history. Situated as I am at the moment on tour in these States, I have but little in the way of reference, and the only facts I can rely on are those for which I can vouch by personal experience.

A. M. BURN-MURDOCH, I.F.S.,

*Chief Forest Officer,  
Federated Malay States and S.S.*

### **The Use and Abuse of Forest Work in Burma.**

IN the November number of the *Indian Forester*, an article appeared by Mr. Gamble in which he makes an attack on the forest administration of Burma—on attack the seriousness of which is at once discounted by the obvious ignorance of the writer of his subject.

Mr. Gamble's personal acquaintance with Burma dates back from over 30 years ago. When newly arrived from Europe he spent about half a year there.

If Burma really were as backward as Mr. Gamble would have us believe, there would be some excuse for it to be found in the fact that it is still a young province, and that forest administration over the greater part of it has not yet existed for 20 years.

It is to be supposed that Mr. Gamble would distrust any figures quoted from annual administration reports to show the real and rapid development of the country, as being more indicative

of overworking the forests and of sacrificing everything to revenue, than of any legitimate expansion; yet any one who has spent any time in the country knows how real and rapid this growth is, resulting in changes which cannot fail to be noticed, not only decade by decade, but year by year.

Mr. Gamble's first point is that in Burma forest conservation and silviculture are subordinated to revenue making.

No justification of this opinion is given, and it is difficult to guess on what it is based.

It is certainly not the opinion of the vast majority of men who have spent most of their service there.

In to-day's issue of the *Pioneer*. (12th November 1903) there is a leading article in which it is stated that so far from any overworking of the forests being the case, there is a general complaint being made by the timber traders against the present *underworking* of the forests of Burma.

It is to be remembered that the conditions in Burma differ considerably from those of Northern India. In Burma the whole country is practically jungle, and cultivations and private lands occupy a very small proportion of the whole area of the country, so that instead of having huge expanses of cultivated and private lands, with comparatively small areas of forest, in which every stick and every bundle of grass has its value, we have in Burma vast areas of forest side by side with a very small agricultural population and a very restricted area of land under cultivation; moreover, in these forests there is generally only the one species, teak, which pays for its cost of extraction and export, and this species only forms from one-tenth to one-hundredth of the entire stock, so that cultural operations, and extensive works of improvement, are generally not only unnecessary, but actually impossible.

It is certainly surprising to read Mr. Gamble's emphatic assertion that the extraction of the only valuable species out of a mixed crop *must* necessarily diminish the proportion of this species in the crop. If this were so, why has not all the deodar disappeared long ago from the less remote of the Himalayan forests? Does Mr. Gamble seriously mean that teak can only be perpetuated in the forests of Burma by means of taungya plantations?

In forests of this kind, provided that the yield is placed at something less than the annual production of trees of exploitable dimensions of the one valuable species, and that only trees which have reached maturity, or which have advance growth beneath and around them ready to take their place, or trees which are not required as seed-bearers, are felled, the proportion of the valuable species may be not only maintained, but actually increased in the forest.

Sir Dietrich Brandis, to whom Mr. Gamble slightly refers as the "old Forester," claiming to have started the Department,

did not mean to refer to any subordination of silviculture to revenue making when he brought forward the fact of the net forest revenue of Burma being greater than that of all the other provinces of India put together.

There can be no doubt that he merely wished to indicate the vast area of forest in Burma, and its value and importance as shown by the net annual revenue, which may very fairly be taken as a criterion for comparing the extent and importance of the forests of one province with those of others. An Inspector-General who knew nothing of the Burma forests, and the very different conditions which obtain in this province, would certainly be ill-equipped for his work.

Mr. Gamble is evidently determined to find no good thing in Burma. Everything is bad.

As regards the taking up of reserves, a work which Mr. Gamble states to be in a very backward state, the yearly rate of extension for many years past has been over 1,000 square miles, and the work of selecting fresh areas for reservation is now almost completed. It is only in the remoter parts of Upper Burma that the undermanning of the staff has prevented this work being carried through.

Demarcation in Burma is not carried out on quite the same line as in Northern India, but it is quite efficient, considering the vast areas to be demarcated, the scanty population of the country and the absence, as a rule, of any friction between cultivators and the guardians of the forests.

If there is one point more than another in which the work of the administration of Burma can compare favourably with that of any other province it is the forest settlements. So far from being bad and backward, as Mr. Gamble says, they are generally better done, sounder and more accurate, both from a practical as well as from a technical point of view, than most settlements in other parts of India.

As regards working-plans too, in spite of Mr. Gamble's sweeping denunciation of them, Burma is not really in at all a backward state. It is true that teak forests only require plans of great simplicity, which offer but little scope to the enterprising amanagist, yet for all that the working-plans in Burma are efficient and practical, safeguarding both the protection and improvement of the crops as well as the regularity of yield, and the only reason why they have not yet been prepared for all the forests in the province lies in the simple fact of scarcity of available officers.

Mr. Gamble declares that of roads in Burma there are "practically none." In Burma there is very little export of timber by road, and forest roads are consequently not so important as they are in other provinces, but still, though one cannot drive round all the forests in a dogcart, it is childish to say that there are no roads.



Houses, too, though Mr. Gamble says that they are "hardly started," are to be found in all divisions, not only at headquarters, but wherever required along most of the roads frequented by Forest Officers, and at all the principal centres of works of felling and extraction, plantations, fire-protection, etc.

The houses are not *pukka*, it is true, but they are of the ordinary style used by the P. W. D. and other departments in Burma, and are quite sufficient.

To say that little is known or done in Burma as regards planting, and that the arrangements for extracting timber are defective, shows an ignorance of facts only equalled by the astonishing assumption that the Government of Burma are deliberately and systematically ruining the forests by overworking them.

BURMAN.

### **Ripening of Seeds of Conifers in the Himalayas.**

WITH reference to the table which appeared on page 574 of the December number of the *Indian Forester*, Mr. McDonell now informs us that the 1st of August and not the 16th is the proper date for the first appearance of the deodar cone, that the pollen shower occurs between 15th September and 1st October, and that both the male flower and the cone are, though very seldom, found on the same tree.

## **III.—OFFICIAL PAPERS AND INTELLIGENCE.**

### **Imperial Forest School, Dehra Dun.**

#### **ANNUAL SPORTS.**

THE cold weather has come in unusually late in Dehra this year, and the first event of the season has been the annual sports of the students of the Imperial Forest School, which took place on the Old Parade Ground, Dehra, on the 26th and 27th October. The tennis and gymnastic competitions took place a day or two beforehand; the first prize for gymnastics was taken by Badruddin and the second by Gopala Krishna. The tennis singles were won by Chengalvaroya Mudeliar and the tennis doubles by Martini and Rahmatulla.

On the first day of the sports, the first heats of the 100 yards and of the hurdle race were run off, while five other competitions were finally decided. Throwing the cricket ball was won by Mohammed Hayat, with a throw of 88½ yards, Carr being second. The long jump was won by Basant Singh, who cleared 14 feet 9 inches.

The mile race was easily run by Daulat Singh, who covered the course in 5 minutes 20 seconds, and who showed his good form by amusing the spectators during the last 100 yards by cantering

home in leaps and bounds. Shiv Dayal was second, and Badruddin third. The sack scrimmage was a new event, and proved a great success. Nineteen students, straitly enclosed in sacks up to their necks, were placed in a small circle marked on the ground, and then left to push one another out of the ring. Those who fell were promptly dragged out, until at last only one conquering hero was left standing within the ring. Gopala Krishna won this. The high jump was won by Turner, who cleared 4 feet 9 inches, with Dangi second. There were very few competitors.

On the second day nearly the whole of Dehra assembled on the maidan between 4 and 6 in the evening to witness the sports, while the band of the 2nd P. W. O. Gurkhas, lent by the kindness of the Colonel and officers of that regiment, enlivened the proceedings. The 100 yards was won by Carr, with Turner and Dangi second. The time was  $11\frac{1}{3}$  seconds.

The hurdle race, 120 yards, over 10 flights of hurdles, was won by Daulat Singh, and Dangi was again second. In this race Turner lead easily the whole way, but unfortunately came to grief over the last hurdle. A flat race of 100 yards for the Forest School servants and for students' servants, was won by Gyan Singh and Rashid. The quarter mile was taken by Shiv Dayal in 60 secs., Carr being second. A quarter mile race for Gurkha sepoy was won by Kishina Damai; Kalnsaki being second, and Sher Singh Damai third. The obstacle race was exceedingly well organised and gave the greatest amusement, while taxing to the utmost the endurance and agility of the competitors. This was won by Daulat Singh. Badruddin was second, and Dangi third. Daulat Singh thus won three first prizes, no other student winning more than one.

The last event, the tug-of-war, was easily won by the junior team. The officers of the Forest School were "At Home" on the grounds, and at the close the prizes were distributed by Mrs. Hobart-Hampden. The sports this year were distinctly above the average, and showed the keen interest the students of the Forest School had taken in getting them up, and in combining to make them in every way most successful.

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#### IV.—REVIEWS.

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##### **Hints on Hill-Travelling in Kashmir.**

THE above is the title of an interesting little book, brought out by Mr. J. C. McDonell of the Indian Forest Service, who has served for many years in the Kashmir State and has, as he tells us, travelled "in the magnificent mountain country of India . . . . . for more than 20 observant years," with the object of helping would-be travellers in India to "camp" in comfort in these regions.

Many of the author's remarks are applicable to most of the more remote and hilly tracts of the Empire and not only to the limited area indicated by the title. "It is laughable," he says, "to see some local magnate start for regions at the back of beyond with his 200 coolies, half-a-dozen tents, beautiful new camp furniture made by some dealer who has never done any camping, ayah on a pony, and so on, and then see how, after even the first march, the house of cards begins to topple over. The patent chairs and bedsteads commence to break, *ayahji* is a nuisance, the coolies are too many to marshal into order, and finally all the grandeur has to be dispensed with, and after the third or fourth day half the tents, with the ayah and sundry useless encumbrances, are dispensed with and marching begins again with a camp of manageable proportions." The "local magnate" in question must surely have been very new to the "locality," but the author would appear to have in his mind's eye some of those "local blisters," rich globe-trotters, who, thanks to the minor attractions of our districts, fortunately leave most of us in peace instead of promoting us to "gamekeepers in ordinary" or "transport officers in general."

Surely Mr. McDonell is unnecessarily hard on the unfortunate "*ayahji*," and we can only hope that he does not class the "*memsahib*" also among the "*sundry useless encumbrances*."

Most of us who have done any camping will probably prefer to any other our own kit and routine, which we have tried and not found wanting in camp. At the same time chapters I and II entitled "Outfit" and "On the March," respectively, contain much information which will be interesting not only to the novice, but also to those who, like their tents, have grown old and worn in the wilderness.

"Strength, comfort, facility of putting together and ease of carriage" are, the author rightly says, essential attributes of camp furniture. To these we would add "simplicity of structure." for breakages will occur in camp so long as the coolie, the mule and the camel retain their characteristics, and all articles should be so made that, if broken, they can be satisfactorily repaired in camp.

The author points out that transport in the hills "is generally limited and hard to get," and it is necessary to pay more attention to the question of carriage hire than in the plains. This of course is true, but it is no less true that every one has his own idea of comfort, and what will be "pigging it" to one may be considered living in luxury by another. Again, there are many whose indolent nature, and possibly sluggish livers, cause them to consider "pigging it" as on the whole most comfortable in camp owing to their intense aversion for the little extra trouble necessitated by somewhat more elaborate *bandobast*.

Regarding chairs, for instance, Mr. McDonell without hesitation "rules out" all chairs with arms, "because hooks are

required and hinges, both sources of weakness." Personally we think arms make all the difference between comfort and discomfort, and we have used chairs with arms during several years' rough camping and have always found them most satisfactory.

A few dimensioned sketches of the articles found most useful in camp would have increased the utility of chapter I.

In the chapter headed "On the March" we are advised as a remedy for sore feet "to take off the boots and put the feet in running water, then change the socks from one foot to the other." Chafed feet, we believe, are, in nine cases out of ten, due to some radical defect in the boots or socks. If these are as they ought to be, there should be no sore feet at the beginning of a tour or at any other time, and if they are not as they should be, changing the socks, etc., is not likely to be of much permanent use. (Of course we can in time accustom ourselves to most things, and we have heard of a canny Forest Officer who, "at the back of beyond," after wearing out his boots, accustomed himself to walk barefoot, so doubtless we can get used to inferior boots and socks, but it is probably better policy to spend a trifle more on such articles and save our epidermis.

Any one accustomed to walking, also, would almost certainly have his own remedies for sore feet, and a non-walker would probably do well to avoid camping in the hills.

We are told that "when the writer has what he likes to describe as a five rupee thirst, one that is worth living for and holding on to till a spring is reached, he generally lies down on the bank, puts his face into the water and drinks a good big draught." . . . . . How often with such a thirst, on going up a bare mountainside in the blazing sun, the thought has come, "Suppose all the drinks known to civilized man, wines and all, were at hand, which would I choose?" "Nothing but spring water" is the invariable reply. "There is no liquid in the world so absolutely refreshing and yet harmless as a deep drink from the bubbling stream that gushes out from under a rock."

We are also advised "to carry some fruit, apples or pears," and to eat one of them "to allay the pangs of hunger" while waiting for breakfast. "Sometimes," we are told, "a grand pool, surrounded by rocks, in a stream or river, is met with; a bathe is a great refresher for those who can stand a cold dip."

Finally, with a burst of enthusiasm, the author says, "It is hardly too much to say that for varied beauty of mighty mountains, tree covered ridges, parklike village greens, beautiful lakes, rivers and mountain torrents, and all the objects that go to make lovely scenery, added to a charming climate almost the whole of the summer, there is no country in the world to equal the vale of Kashmir." We cannot but envy Mr. McDonell his happy lot in spending so many long years in the midst of these and other delights!

In common with so many of us, Mr. McDonell has during his Indian career come to the conclusion that a happy existence is impossible without a *hobby*, which soon becomes a friend to which we can always turn when all else fails us, and we have to remember that in the hills there may be no "useless encumbrances" in the camp! In addition to painting, sketching and shooting, which are merely mentioned, fern-collecting and the *cutting and making up of walking sticks* are recommended, in particular, as suitable hobbies for Kashmir, "which cost a man nothing and require little or no preparation." It is pointed out that July and August are the best months for fern-collecting in the Himalayas

The author is himself clearly an enthusiastic and successful fern-collector, as will be seen from the following: "The writer well remembers finding the first specimen of *Osmunda claytoniana* seen in Darjeeling. . . . He was elaborately got up in frockcoat, etc., on his way to make a call, riding along the Mall, when his roaming eye, always on the look out, suddenly saw something high up a bank of red clay. All thoughts of the call were forgotten, he jumped off his pony and climbed up the bank and got his prize." Again, "The earnest collector always has the hope of discovering a new species which the authorities may decide to name after him; this is a great ambition and one by no means impossible of realization. The writer began to collect in Darjeeling in 1879, and in 1882 the height of his ambition was attained by finding in the Bhandal Valley, in Chamba, a large fern which he at once saw was new to him at any rate. In 1888, when on furlough, he went to Kew Gardens and it was carefully examined and compared with the specimens in the great herbarium there and pronounced to be new to science and a good species. Major-General Beddome, the author of the Hand-book on Ferns, which is the collector's stand-by, then described it and named it *Athyrium McDonelli* and thus it still stands"

Regarding walking sticks, the author makes the novel suggestion to "cut on the name of the camp on arrival, when waiting for the tent to be pitched," the names running in a spiral round the stick, it being, we are told, "a great pleasure to read the names in after years, besides being a handy guide to the marches on the various journeys made." Personally, we should be very sorry if we were obliged to lay aside an old friend, however scarred, cracked, discoloured or ugly it might be, when the names had reached its extremity, in favour of a new, untried and unfamiliar staff, albeit with bark intact and beautiful alike in colour and figure. From the ingle-nook, a rugged old blackthorn is now looking at us, which has been our constant companion for the last ten years, and our affection for it has perhaps caused this prejudice in favour of friends, few but staunch, ugly but true.

In the fourth and last chapter Mr. McDonell describes briefly „an ideal trip in Kashmir" starting from Srinagar "to Kunis

village, thence up to Rampur and over into the Lolab and on round to Baramula" whence the traveller returns to Srinagar. A map would have made this chapter more intelligible and have added generally to the value of the book.

The author doubtless had good reasons for omitting all mention of the game birds and animals to be met with in Kashmir, but a brief note on the subject would, we believe, have made the volume more interesting to the ordinary traveller.

The little book closes with a list of the ferns of Kashmir and adjacent regions and a list of "requisites for hill travelling for one person." It is neatly bound and printed by the *Pioneer Press* and is priced at one rupee.

### **Progress Report on Forest Administration in the Punjab for 1902-1903.**

THE area of forests in the Punjab remains practically the same as last year, although some important corrections of area have been made. There are now altogether about 9,600 square miles of forest, of which nearly 2,300 square miles are reserved forests belonging to the Forest Department.

The provisions of existing working-plans were generally, with a few unimportant exceptions, worked up to.

As regards new working-plans, a revised list of works of improvement to accompany the plan for the Upper Ravi forests in Chamba, has been sanctioned, and new plans are also in course of preparation for the Sutlej Valley and for Kangra, the latter being now almost completed.

The revised working-plan for the Kotkhar and Kotgarh forests in Simla has been sanctioned, while plans for the forests of the Jubal State and for the Shahdara plantation have been sent up for sanction. Plans for the Hill States of Balsar, Theog and Mailog were completed, and plans for five other States are under preparation. In Montgomery a provisional scheme of fellings for twenty years has been drawn up.

Under the head of "Breaches of Forest Law," 3,890 cases are reported for the year under report; this number, though large, is less than in the preceding year.

872 cases were taken into court, and convictions were obtained in 82 per cent. of this number.

2,820 cases were compounded, and the average amount of compensation thus taken from the offenders comes to less than two rupees per head.

198 cases were undetected. Of the total number of 3,890 cases, 197 were offences connected with fire, 1,787 were cases of unauthorised fellings or appropriation of wood or minor produce, 1,799 were cases of grazing in closed areas without permission, and 107 were other offences.

Most of the cases were of a trivial nature, though one serious case of rescuing cattle seized for trespass took place, in which five offenders were sentenced to five years' imprisonment and another to two years' imprisonment. Fire protection, as usual, was very successful, though only Rs.4,802 was spent on it. Nearly 900 square miles were specially protected, of which 2 per cent. were burnt. The area burnt was 0·3 per cent. of the total area of forest under the Department.

The number of fires reported during the season was 203, of which the large number of 80 are ascribed to intentional firing, 65 to carelessness or accident, 20 to external fires spreading into the forest, 7 to carelessness in burning lines, and 31 to causes unknown.

As regards grazing, the percentage of closed area compared with the area available for grazing, was 19·09.

495,832 animals were grazed at full rates, and 255,704 at privileged rates, yielding a revenue of Rs. 32,468. 32,632 animals were impounded during the year.

Under the head of natural reproduction, that of deodar is reported to vary very much with different conditions of light and moisture, but to be very good wherever these conditions are favourable. The reproduction of the pines in the hill forests is always good, and in the plains, reproduction of deciduous species by coppice shoots is generally satisfactory.

Plantings and sowings of deodar, *shisham*, chir and other trees appear to meet with little success in the Punjab.

Thinnings are known to be required in nearly all the forests containing young crops, but it has not been found possible to undertake them, owing to the small number of trained officers available, and to the difficulty of disposing of the produce.

One interesting point in the report is the announcement of sample plots being selected in all hill divisions for experimental thinnings, with a view to ascertain the degree of density of single-aged crops of deodar, blue pine and chir, corresponding to the largest production per acre, and to find out the true age of exploitability of such crops. We should like to hear of some attempt being made at the same time to ascertain the best proportion between the different girth classes, which is a matter of as much importance as the actual optimum degree of density.

Under the head of fellings, it is interesting to note that the average annual yield per acre in the coppice at Changa-Manga and Shahdara has been 204 and 230 stacked cubic feet respectively, while in some of the *rakhs* this annual rate of production per acre does not amount to more than 12 cubic feet stacked.

Some interesting figures are also given in connection with the enormous loss in transit on the Chenab river from the Pangi forests. The annual loss in the log has been 28 per cent., of which 15 per cent. is attributed to "shrinkage," and 13 per cent. to loss

in transit. With scantlings the loss is even greater, and amounts to 32 per cent on the Sutlej; the loss of logs in transit from the Bashahr forests is 22 per cent., and that of scantlings is 18 per cent.

By measurements made during the last five years it has been found that for every 100 c. ft. of log measured in the forest, 9 c. ft. (chiefly due to the knocking off of the bark), is lost on the way from the forest to the river. Of the 91 c. ft. launched in the log, there will be a loss of about 16 per cent. or 14.5 c. ft. on account of shrinkage, and wear and tear in the water, and 5 or 6 per cent. on account of breakages and thefts in transit. Therefore out of every 100 c. ft. cut in the forest not more than 72 c. ft., some two or three years later, reaches the sale depôt.

As regards sawn timber, for every 100 c. ft. cut and sawn, not more than 52 per cent. of scantlings will be obtained, as there is an average loss of 48 per cent. in conversion. Of these 52 c. ft., 5 per cent. is lost in transit, so that not more than 49 per cent. of scantling, out of every 100 c. ft. cut in the round, reaches the sale depôts. No deduction is made for shrinkage in the case of scantlings, which do not contain sapwood, as is the case with logs. Scantlings are moreover usually cut slightly larger than the standard sizes to allow for shrinkage and wear and tear, and the loss on this account is included in the loss by conversion.

The outturn from the Changa-Manga plantation during the year under report was 2,306,000 c. ft. stacked of fuel.

The total value of grass removed from the forests was Rs.77,226, and the value of the grazing in the forests was Rs.3,58,947.

The resin industry is still flourishing.

During the season of 1902, 25,260 blazes were worked, and yielded 2,495 maunds of crude resin, just under 4 seers per blaze. The cost of collection and delivery at the distillery amounts to Rs.1-15-0 per maund.

During the present season of 1903, 60,000 blazes are being worked. All the resin remaining in stock has been sold at Rs.3-10-0. The surplus for the year's working of the resin distillery was Rs.16,920.

The possible yield of resin of the Kangra forests within reach of the distillery is estimated at 10,000 maunds, which should produce 15,000 gallons of turpentine and 7,500 maunds of resin.

The turpentine can always be sold, but the average sales of resin do not exceed 3,000 maunds per annum, as the local traders do not like Nurpur resin, and buy imported resin at Rs.5 per maund.

The following statement gives a summary of the produce removed from the forests :—



Agency.	Timber.	Fuel.	Bamboos.	Grass and grazing.	Minor produce.
	C. ft.	C. ft.	Nos.	Rs.	Rs.
Government Agency,	124,489	4,746,881	113,670	...	28,894
Purchasers ...	824,602	1,173,783	863,534	1,32,947	16,229
Free grantees ...	40,933	101,692	...	7,844	...
Right-holders ...	957,379	33,309,897	...	2,95,382	44,772
Total ...	3,066,703	39,332,253	977,204	4,36,173	89,896

The following statement shows the results of the year in timber and other produce removed by Government agency and by purchasers and consumers :—

Produce.			By Govern- ment agency.	By consumers and pur- chasers.
<b>TIMBER.</b>				
Selection fellings	... c. ft.	...	1,104,131	238,073
Improvement fellings	... "	...	77,132	137,448
Coppice	... "	...	28,061	...
Unregulated	... "	...	35,045	446,075
Thinnings	... "	...	...	2,406
<b>TOTAL TIMBER</b> ...			1,244,389	824,002
Fuel	... c. ft. solid	...	4,746,881	1,173,783
Bamboos	... No.	...	113,670	863,534
Grazing and fodder grass	... Rs.	...	...	1,32,947
Minor produce	... Rs.	...	28,894	16,229

The following statement gives the outturn of deodar, pine and other timber for the year :—

By Government agency.				By purchasers.			
Deodar.	Pine.	Other timber.	Total.	Deodar.	Pine.	Other timber.	Total.
c. ft.	c. ft.	c. ft.	c. ft.	c. ft.	c. ft.	c. ft.	c. ft.
914,539	299,549	30,301	1,244,389	55,604	553,836	214,662	824,002

The following statement gives the produce and the estimated value thereof given to free grantees and right-holders :—

	TIMBER.		FUEL.		MINOR PRODUCE.	GRASS AND GRAZING.	TOTAL VALUE.
		Value.		Value.	Value.	Value.	
		Rs.		Rs.	Rs.	Rs.	Rs.
Right-holders ...	c. ft. 957,379	40,932	c. ft. (solid). 31,309,897	3,90,010	44,772	2,96,382	7,71,116
Free-grantees ...	40,933	4,365	101,692}	5,635	...	7,844	17,844
Total ...	998,312	45,297	33,411,589	3,95,645	44,772	3,03,226	7,88,980

The total revenue and expenditure for the year under report are respectively Rs.15,91,665 and Rs. 11,40,987, leaving a surplus of Rs. 4,50,678. During the year, an extraordinary payment of Rs. 1,61,585 was made on account of the share of profits of the Chamba State for the three years 1899-1901. Excluding this payment, the financial results are —

			Rs.
Revenue	...	...	15,91,665
Expenditure	..	...	9,79,404
Surplus	...	...	6,22,261

The proportion of surplus and of expenditure to gross revenue amounted thus to 38 per cent and 62 per cent. respectively: the same as in the previous year.

The proportion of gross revenue spent on protection and improvement amounts to 12 per cent., of which amount 16 per cent. was spent on roads and buildings.

### Ceylon Forest Report for 1902.

THE Ceylon report this year is by Mr. A. Clark who acted as Conservator for part of the period between the departure of Mr. Brown for the Soudan and the arrival of Mr. Pigot from Assam. The forests still continue to be under the charge partly of the Government agents and partly of Assistant Conservators. It is presumed this arrangement is continued for financial reasons and on account of the paucity of superior officers in the Department. The financial side of a question is always an important one, especially in a province where the forests of two of the circles are managed at a heavy loss, but it would seem imperative on all grounds to have a Departmental Officer in charge of the Southern Division, which provides the largest surplus this year, viz., Rs.32,306, and the forests of which are worked by a Forest Ranger on Rs.60 a month, under the orders of the Government Agent.

The area of reserved forest at the close of the year was 687 square miles, of which 253 square miles were added during the year. Proposed forests amounted to 1,272 square miles and "other" forests to 10,710 square miles. These figures indicate abundant scope for energy for some years to come in pushing on forest settlement work. A definite settlement programme, showing the areas proposed to be reserved and the ultimate total area of reserved forest in each division, would be a great help. The work of demarcating boundaries was only taken up some two or three years ago. 293,000 chains of boundary have now been demarcated, including 25,000 done during the year under report. The total amount spent on demarcation has been Rs.1,13,227, and the Conservator appears to consider the money might have been better spent, remarking that—

"There are now many hundreds of miles of boundary lines, the larger portion cut through wild uninhabited country and demarcating forests which are not likely to be taken up for systematic working for many years to come. If these lines are not attended to, they will in a few years become overgrown and obliterated. The cost of re-clearing will be very heavy and ever increasing, and is likely to become in time an intolerable burden on the Department."

No working-plans were attempted, but information for the preparation of the same was collected by means of enumeration surveys and the formation of sample plots. Among other trees measured in the sample plots were satinwood and ebony, and the figures for satinwood show that the number of years which it would take for a tree to increase from 9 inches to 6 feet girth varied according to locality from 87 to 177 years, while for ebony it varied from 90 to 186 years.

Systematic fire-protection does not exist, nor is any return given of the area burnt over during the year. One Assistant Conservator reports the fires to have been very disastrous in their effects, and expresses the opinion that "unless very stringent measures are taken to prevent this utter destruction of valuable forests, these forests will be exterminated." The Conservator's comment on this opinion is that "such a fate may happily be regarded as rather remote." Remote it may be, but an early attempt at fire-protection would appear indicated. We gather that forest offences were rife in many districts, illicit felling of timber and illegal mining and cultivating were the most common. The two latter are not likely to decrease until the forests are demarcated thoroughly and the boundaries efficiently maintained in spite of their being a drag on the department.

Natural reproduction suffered from the abnormally heavy rainfall which took place during the last four months of the year. Flowers, fruit and seed all suffered, with a consequent diminution in the seedling crop. Over Rs. 10,000 was spent during the year on plantations, of which there is a total area of 1,291 acres. In

the Western Province it was proposed to start a plantation for railway fuel, but its commencement was deferred as the financial prospects of the work were not good. Experience in India has repeatedly shown that railway fuel plantations on a small scale are not a success. They are expensive to make and their upkeep and protection are so costly that the cost of fuel from them when ready for cutting is too high for the railway to pay, with the result that it goes elsewhere for its wood or burns coal.

Rupees 6,100 were spent on buildings during the year, and Rs.2,923 represents the very inadequate outlay on communications.

Timber to the value of Rs. 243,877 and firewood to the value of Rs.77,632 were sold by the department during the year. The material was either collected departmentally or removed under payment of royalty.

The prosperity of the department depends mainly on sales at the Central Timber Depôt, Colombo, and to keep this supplied with timber forests are ransacked for first class trees even in remote parts of the Island. Little or no attempt is made, except in the Eastern and North-eastern Circles, to confine fellings to certain forests and to work through them systematically, "taking the lean with the fat" year by year. There are great numbers of trees the timber of which is sound and durable, but which cannot be sold in the log on account of their small size, but which if sawn up would yield first class building material. The Northern Railway, when completed, will open up forests containing quantities of such second class trees, the timber of which, if sawn up and conveyed at cheap rates to Colombo, would doubtless realize fair prices.

The financial results of the year's working were as follows :—

			Rs.
Receipts	...	...	3,60,261
Charges	...	...	2,68,591
			<hr/>
Surplus	...	...	91,670

This surplus shows a decrease of Rs. 14,600 on that of the previous year, and may be explained by the extraordinary decrease in the value of timber supplied to the Public Works Department. In 1898 the value of the timber supplied was Rs. 2,77,316, and it has diminished regularly each year until in 1901 it only amounted to Rs. 76,161 and in the year under report to Rs. 38,077.

## VI.—EXTRACTS, NOTES AND QUERIES.

### The Timber Trade in Burma.

FORESTRY in India as a timber-raising agency is comparatively a young business; how young one does not realise till confronted in Burma with the effects of the old pre-Forest management felling leases, which reveal how great and near was the risk of ruin and deforestation from which the foresight and alertness

of Sir Dietrich Brandis and his successors has saved us. At the present moment the European public interested in Burma timber is divided into two hostile camps, especially as regards Upper Burma. In the latter province the simple rule of Theebaw and that queen whom Tommy Atkins calls "Soupplate" made felling an exceedingly easy business, since it was only necessary for the lessees to cut down every timber tree they could convey to the market, without any thought of replanting, make their profit, and leave the future to look after itself. Similarly with the 99 years' leases given by the British Government in Tennasserim at the beginning of the last century. No restrictions were placed on the wood to be cut, whether young or old, good, bad or middling: all was fish that came into the net of the concessionaire. The result was that when the leases fell in, there were no timber trees of any value left in the areas, and very few young trees were coming on. Now the Forest Department has issued stringent orders as to the conditions under which future leases will be granted and felling allowed. But the transition from one system to another has naturally brought much inconvenience in its train and has produced a dislocation in the trade for the time being.

On the one hand the timber traders urge that Government has them by the throat, that it hardly pays to cut timber at all, and that if they cannot get easier terms they will have to give up the trade altogether. On the other hand, the Forest Department officials argue that, owing to the abuses of felling in the past, they must enforce stringent rules for several years to come or they will have no timber worth protecting. It is a difficult situation, because, owing to the slackness of dead and gone officials or the one hand and the abuse of privileges on the other, there really is a good deal to be said on both sides. The principal Burmese timber is teak, and round this the main dispute centres. The teak tree takes about a hundred years to mature, and if it is not to die out, very stringent rules as to replanting and also as to leaving untouched all trees of moderate growth—mere children of a paltry forty or fifty years' life—are absolutely necessary. If they are enforced now, the teak forests will regain their former value some forty or fifty years hence! But it is evident that adult timber merchants cannot wait forty or fifty years for a prosperous trade, and—to come to the real crux of the whole question—teak is not valuable enough or important enough to be dealt in at anything but a low figure.

This may seem a heresy at first sight, but it is an actual fact, and a fact that very greatly complicates the situation. Teak is a fine, fairly hard timber, with one serious limitation—it must not be relied on in dry climates. Burma has a damp climate and consequently teak shows at its best there, and does work that cannot be excelled either for strength or durability by any other timber of the same weight. Teak is also excellent timber for the

building of ships, since ships are always on the water and are consequently never in an excessively dry climate. But the various kinds of pine run teak very close in the shipyards, and unless the price of the Burma timber can be kept very low, it cannot compete with the products of Sweden, Russia and America, since the freight to the shipyards of Europe is so much higher. In fact the main cost lies not so much in the initial price of the tree as in the handling. The tree has to be girdled, then felled and lopped, dragged to the river bank, rafted and floated down, handled ashore, conveyed to the mill, where it is cut up in the roughest possible way, after which the planks have to be carted to the ship's side, loaded, sent Home, and again handled there. It is evident that each item of charge must be kept as low as possible if the cost of the timber in England is not to be prohibitive. This is one reason why teak in Burma is cut up with great circular saws instead of being scientifically made the best of as to each log by log-cutting band saws and vertical frame saws, as is done elsewhere. The large circular saw cuts up the logs quickly and cheaply and is itself a cheaper thing to run than any other kind, but it does not make the best of the timber, is very wasteful, especially if the saw is a little out of the true—a very common fault in that type—and does not enable the mill foreman to make the most of each log or, in the parlance of the lumber trade, to “convert it to the best advantage.” All this is rendered necessary by the very small margin of profit possible with teak, and it is evident, therefore, that the timber trade is not altogether “talking off the top” when it says that the present stringency of the conditions may force it to go elsewhere for timber. The Indian Government is constantly possessed with one persistent and remarkable delusion. It believes that, because certain kinds of State contracts have proved very profitable in past years, every private trader is so anxious to deal with it that any conditions, however hard and humiliating, will be accepted rather than that the contract should be lost. This idea is a pure delusion bred of the strange ignorance of and contempt for the ordinary details of trade, which are commonly prevalent among officials. In some ways the general public would benefit by the substitution of pine for teak, since pine will stand a dry climate. That is to say, it will shrink once for all in a dry atmosphere, and is then fairly reliable; whereas teak will expand and contract like a concertina, for twenty years. Thus teak is practically only of value for shipbuilding, and as ships are, in these days, almost invariably built of iron, this means that teak is mainly valuable for decks and fittings. Since the fashion for very narrow deck planks has come in, pine has a better chance of competing with teak than ever, since, with narrow deck planks, the knotty pieces can be cut out and used for other work with very little loss. We do not want to prove the case too fully; teak is a valuable timber—at a price—and if it is more or less withdrawn from the market it will

be a great pity; but it is not a necessity of civilisation, and its value is very largely due to custom. Once let the supply fail for a period of years and the want will be supplied from other sources, and the value of teak will fall to that of junglewood. Therefore it would appear that the stringency of the Government orders as regards felling—the necessity of which any reasonable person must admit—should be administered as far as possible with a view to the reasonable exigencies of the trade.

The point is the more important because the timber-producing capabilities of India are not as great as is usually supposed, and, as regards high class timbers, at any rate, is steadily falling. Possibly some relief may be found in the more intelligent treatment of some of the timbers now generically known as “junglewood,” but these can hardly be of any serious commercial value. It is astonishing how very small a proportion of the trees in any given plot of forest really produce good timber. Look at any clump even in a good Indian forest carefully and, unless you have been exceptionally lucky in your choice, you will find that very few of them would satisfactorily repay the labour of cutting up. Many a fine-looking tree has very little trunk, or its trunk is distorted and gnarled so as to produce very inferior timber. It is only where a tree grows under what, for want of a better name we may call favourable “timber” conditions, that the yield is good. Every one is aware that “timber” is not the sole object of forests, but it is a very important object to any country; and the Forest Department has done so much for India in many ways that we may safely ask it to give a close and enlightened consideration to the important question whose bearings we have endeavoured to point out.—*Pioneer*.

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SOUND ADVICE FROM BOMBAY.—The following extract is taken from the remarks made by Mr. F. S. P. Lely, Commissioner, Northern Division, Bombay, in forwarding to Government the annual report of the Conservator, Northern Circle, for 1901-02. They are of interest and very much to the point:—

5. The number of cattle impounded has largely increased. This is to be regretted; but until the closed forests are fenced, which is impossible, or until the people keep their cattle under control, it is not understood how forest conservation can be made a reality without it.

6. The Conservator reports the abandonment of one nursery and hints at that of several others. In the Commissioner's opinion they are all based on a wrong principle. They are merely plots where seedlings of such trees as teak and tanach are reared and then transplanted to sections of forest area which must be of limited size even for the produce of a big nursery. This method

would be well enough for a private landholder who wanted to put a few hundreds of acres under timber, but the Government forests are far too extensive to be treated as mere plantations. The ordinary trees of the country should, it would seem, be regenerated by assisting natural reproduction and by direct sowing.

7. There should, however, be a central nursery for each Division, if possible at head-quarters, and under the personal care of the Divisional Officer. It should gradually take on the character of an experimental garden, where new products are being constantly tried and diseases and pests and other problems of interest being studied as far as may be. The forest reports that come in year after year betray little consciousness that advance is required. They are the accounts of a timber merchant in a huge way of business who devotes himself to growing teak and bamboos and selling off his stocks at the best possible price. The Commissioner does not mean to disparage the financial side, and no one who can remember the aspect of 30 years ago can refuse to admire the great work done by the department in clothing once bare hills, but unless the country is to remain stagnant and worse, some higher ideal must be aimed at than to restore its original forests. India ought to be well ahead of Ceylon, but it is far behind in this line. The Divisional nursery should also contain in time a complete collection of specimens of such of the forest products of the Division as can be turned to the use of man both in the living plant and in the form suitable for commerce. It is regrettable that at the present time a stranger on entering a district, whether bent on science or business, would find no ready means of learning what the forest can produce.

There is not much effort made to meet the demands even of industries that have established themselves, if they are off the beaten track. The matchmaking industry, which seems to be come to stay, needs a certain class of wood which will be exhausted in very short time, but no attempts to keep up the supply have been heard of. The fact that the department had to use Moulmein teak for building its own depots in South Thana does not, as Mr. Wood says, sound satisfactory, though doubtless open to explanation.

8. Unlike most modern propositions, the Divisional nursery, if run as it should be on modest lines at first, should cost Government little, probably not more than one of the fields now kept up for growing young teak trees. The usual difficulty of paying for highly skilled supervision would not occur, as Government have at their hand as keen and well educated a body of officers as need be wished for. In the rains they have leisure, and at all times it seems a pity not to employ the scientific knowledge and zeal which many of them possess in incidental experiment and enquiry.

A PRIZE ESSAY ON FORESTRY.—It is well known that one of the old City Guilds—the Worshipful Company of Carpenters—has



taken an interest in the advancement of workers in wood by arranging lectures on technical subjects at their hall in London Wall. This company is now going a step further by offering two prizes of the value of £20 and £10 for the best and second best essay on the following subject:—

“Adaptation of land which has either gone out of cultivation or which has only a very low rentable value for afforestation: showing the mode of procedure from taking the land over, and for 20 years after; and some statistics as to what returns may be looked for from this period up to maturity.”

The essays of the prize-winners are to be the property of the Carpenter's Company, who shall be at liberty to publish and reproduce them. All essays, which should be either typed or legibly written, are to be sent to the clerk of the company at Carpenters' Hall, London Wall, London, E.C., by the 31st December next.—*Timber Trades Journal*.

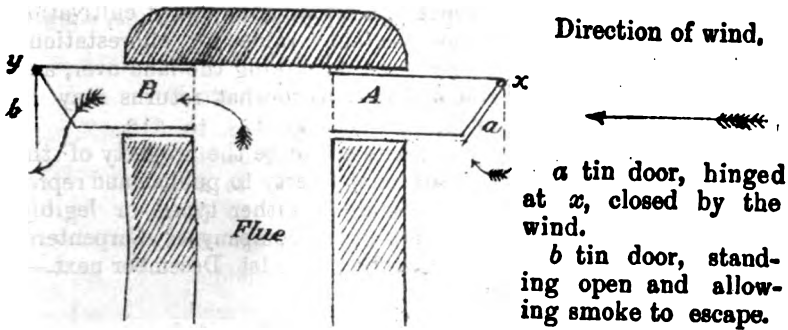
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**REAFFORESTING THE MIDLANDS.**—It would be impossible to over-estimate the value of the work being done by the Midlands Reafforesting Association, whether the results be viewed from the utility or æsthetic standpoints. This Association was formed to promote reafforesting the Midlands waste ground, particularly in the parts of Staffordshire and Worcestershire known as the Black Country. Once the Black Country was a forest, and the Association does not claim to be the first to attempt its replanting. It seeks rather to make the knowledge gained from previous attempts, their successes and their failures, the basis of a great public movement, which shall restore to the district some of its ancient beauty, and render back its waste places to the service of men. Independently of the help so freely given by the Press, the Association proposes to spread its views by means of pamphlets and lectures. It is also prepared, says the prospectus, to give expert advice on planting to point out the trees most suitable for any locality, to assist and inform all who may contemplate planting on their own account, and further, if opportunity offers, to establish model or demonstration plantations. Fully to attain these ends many members and many helpers will be needed, and in the first place all public-spirited persons are invited to co-operate with the Association in forming local Committees and making arrangements for a series of lantern lectures, to be delivered in the Black Country towns during the coming winter season. The general honorary secretary of the Association is Mr. Herbert Stone, Bracebridge-street, Birmingham. •

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**SMOKY CHIMNEYS.**—Smoky chimneys are such a nuisance to everyone that it may not be amiss to note an ingenious contrivance which was invented by Mr. Rama Dutt, Extra-Assistant Conservator

in the School Circle, to prevent smoke being blown back down the flue of a forest house situated in a very windy locality. The materials used were an old kerosine tin and some wire.\* The following sketches will explain it:



It will be seen that when the wind blows from, say, the right the small door *a* is closed by it, and so prevents the smoke being blown back at the outlet *A*, while door *b* of course remains open in its normal position, which is hanging vertically from the hinge *y*, and the smoke escapes through the outlet *B*. Similarly when the wind blows from the left, door *b* closes and door *a* remains hanging vertically from its hinge *x*. I have only seen this plan applied to a chimney with smoke outlets on two opposite sides, when it acts perfectly, but imagine it would act equally well with outlets on all four sides of the chimney stack.

## VII.—TIMBER AND PRODUCE TRADE.

### Churchill and Sim's Wood Circular.

3rd December 1903.

**EAST INDIAN TEAK.**—The deliveries for November have been 1,176 loads against 1,279 loads in November last year, and for the past eleven months they have been 10,772 loads as compared with 11,760 loads for the same period of 1902. The London market has been dull during November, with prices perhaps a point down if anything. There is no change to report in prospects ahead.

**CEDAR.—EAST INDIA.**—A small shipment has just arrived, and if the logs are of good colour and sound, they should realise fair prices. The arrivals consisted of 16 logs.

\* Square tubes of tin are inserted into the orifices from which the smoke issues. They stand a short way out from the chimney stack, and are cut off obliquely at their outer ends, while each has a small door hanging vertically (and therefore open) when there is no wind.

**ROSEWOOD.—EAST INDIA.**—Several parcels have arrived and there is a steady demand for good wood, but small and inferior logs are neglected.

**SATINWOOD.—EAST INDIA.**—Sells very slowly, as the demand is dull and stocks heavy.

**EBONY.—EAST INDIA.**—The only enquiry is for prime, sizeable logs.

### PRICE CURRENT.

Indian teak, logs, per load	...	£9-15s. to £18.
" " planks, " "	...	£12-5s. to £20.
Rosewood, per ton	...	£8 to £11.
Safinwood, per s ft.	...	6d. to 18d.
Ebony, per ton	...	£7 to £10.

### Denny, Mott and Dickson, Limited.

#### WOOD MARKET REPORT.

London, 1st December 1903.

**TEAK.**—The landings in the docks in London during November consisted of 1,105 loads of logs and 350 loads of planks and scantlings, or a total of 1,455 loads, as against 393 loads for the corresponding month of last year. The deliveries into consumption were 804 loads of logs and 377 loads of planks and scantlings—together 1,181 loads as against 1,148 loads for November, 1902.

The dock stocks at date analyse as follows:—

6,967 loads of logs, as against 5,635 loads at the same date last year.	
3,820 " planks, " 2,987 " " "	
— " blocks, " — " " "	
Total 10,796 loads " 8,622 loads " "	

The difficult conditions of the teak market have continued. Prices at the shipping ports are maintained, and consumption on this side is confined to constructive work, where teak is, or from custom is thought to be, a necessity. Substitution of other material, however, continues to steadily grow, and both shippers and importers will have to reckon with a narrowing of the market for a long time to come, as the cost of marketing a short production at onerous prices.

Business during November has been of a marked hand-to-mouth character, as the approaching end of the year has brought home peculiarly to traders the prudence of husbanding their resources in face of dull trade, political unsettlement and an increasing tendency on the part of bankers to limit financial facilities and charge very full rates for trade bills.

**Market Rates for Produce.***Tropical Agriculturist, 1st December 1903.*

Cardamoms	...	... per lb.	1s. 6d. to 1s. 7d.
Croton seeds	...	... „ cwt.	15s. to 22s. 6d.
Cutch	... ..	... „ „	22s. 6d. to 30s.
Gum Arabic, Karachi	...	... „ „	24s. to 27s.
Do. Madras	...	... „ „	15s. to 20s.
Gum Kino	...	... „ lb.	3½d. to 5d.
India-rubber, Burma	...	... „ „	2s. to 3s. 4d.
Do. Assam	...	... „ „	2s. 3d. to 3s. 6d.
Myrabolams, Madras	...	... „ cwt.	5s. to 6s.
Do. Jubbulpore	...	... „ „	4s. to 5s. 6d.
Do. Bombay	...	... „ „	4s. to 7s. 6d.
Do. Bengal	...	... „ „	3s. 6d. to 5s.
Nux Vomica, Bombay	...	... „ „	5s. 6d. to 6s.
Do. Madras	...	... „ „	7s. to 10s.
Oil, Lemon grass	...	... „ lb.	5½d.
Orchella weed, Ceylon	...	... „ cwt.	10s. to 12s. 6d.
Sandalwood, Logs	...	... „ ton	£15 to £30.
Do. Chips	...	... „ „	£4 to £8.
Seedlac	...	... „ cwt.	160s. 6d. to 190s.
Tamarinds, Calcutta	...	... „ „	8s. to 12s.
Do. Madras	...	... „ „	4s. 6d. to 6s.







# THE INDIAN FORESTER.

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[No. 3.

**Holigarna nigra: A new Species communicated by  
J. F. Bourdillon, F.L.S.**

ANACARDIACEÆ.

*Holigarna nigra*, sp. nov.

Leaves 3—6 in. by 1—2½ in., simple, alternate, entire, spathulate, dark green, very coriaceous, with 6—9 pairs of prominent secondary nerves. *Petiole* ½—1½ in. with 2 or 4 spur-like appendages. *Flowers*—dioecious, in terminal and axillary racemes and panicles, up to 12 in. long in the case of the male flowers and about 3 in. long in the female. Male flowers ½ in. across, female rather larger, all on very short pedicels. Petals 5, white, clothed with white hairs, calyx black villous. Stamens 5, white, with black globose anthers. Ovary 1-celled. Styles 3—5. Drupe not seen.

A large evergreen tree occurring in the forests of Travancore between 2,000—4,000 feet; height 100 feet, diameter 2 feet; flowers in April.

Bark smooth, grey, ½ in. thick. Juice black. Wood very soft, coarse and open-grained, greyish-white. Pores large and scanty. Medullary rays fine and close together. No annual rings.

Weight = 31 lbs., P. = 408.

The wood is useless, nor does the tree appear to have any valuable properties.

This tree differs from *H. Arnottiana* by its smaller leaves, more slender panicles, and its sooty flowers. The two species are never found together, *H. nigra* occurring on the hills and *H. Arnottiana* being confined to the low country. [See Brandis' *Indian Trees*, p. 203.]

## Suggestions regarding Local Forest Floras.

By R. S. HOLE, F. C. H., F.E.S.

In the November number of the *Indian Forester*, Vol. XXIX, Mr. Gamble remarks, "I well remember the secret feeling of despair which I had when in 1872 I was sent to work in a region of many trees very little known. There were no "Forest Floras" no *Flora of British India*, no lists with



native and scientific names, and except one or two kinds, nobody knew which trees had good timbers, which worthless ones, what kinds were useful for building, which for fuel, what for valuable minor products, and so on." In the thirty odd years which have passed since then, a vast deal has been done towards helping Forest Officers to know their trees, more particularly by the *Forest Flora of the North West and Central India* by Sir D. Brandis and the *Manual of Indian Timbers* by Mr. Gamble, while the book which Sir D. Brandis is now preparing will do a great deal more. At the same time a great deal still remains to be done, and no time is to be lost if the present generation of Forest Officers is to show itself worthy of its great predecessors in the Department, if it is to obtain the full benefit of the work done by these great pioneers, if it is to carry on and extend what has been so splendidly begun.

2. There are, for instance, species of considerable local interest and importance in the areas where they are found, but which are not of sufficient general interest to warrant their inclusion in works of the scope of those quoted above. There is also a quantity of information regarding species which are mentioned in these books, which, although it is of the greatest utility to the Forest Officer in the locality to which it particularly refers, cannot be included in any one general work, owing to the exigencies of space and also because of the fact that, even if it were so included, it would be practically useless, owing to its being obscured and hidden by a mass of other information which is of more general importance. In other words, the great books of Sir D. Brandis and Mr. Gamble occupy very much the same position with regard to the Forest Department as does Sir T. Hooper's *Flora of British India* with regard to the general public, i.e. they are intended "to facilitate the compilation of local Indian Floras."

3. It is also now recognized that it is necessary not only for the officers belonging to the higher grades of the Service, but also for our subordinates, to have an intimate knowledge of the more important plants which compose the immense and varied forests in our charge, and, with this object, the students of the Imperial Forest School are taught to know and take an intelligent interest in the trees and shrubs which they see around them, during their course of training at Dehra Dun—a task which is now made easy through the existence of the excellent little *Forest Flora of the School Circle, N.-W. P.* by Kanjilal. This volume is priced at Rs. 1-8 and is therefore well within the means of all our English speaking subordinates. Works within the scope of those of Sir D. Brandis and Mr. Gamble, exceedingly moderate in price though they are, cannot possibly be produced at the same figure as can small local "Floras." It is obviously, also, of the utmost importance that the students after leaving the Forest School should find local "Floras" available in the various districts to which they may be

posted, which will encourage and help them to keep up and extend the knowledge gained at the school. Failing this, their excellent course of training loses much of its utility.

4. When any of us are now sent to a forest region of which we have little or no personal knowledge, although happily we are, in great part at least, free from the feeling of despair which assailed Mr. Gamble in 1872, still there are numerous questions of importance which we at once begin to ask ourselves, to which the answers are not readily forthcoming. In some cases the information we seek is contained in books and official records, but we cannot readily discover it; in many cases, although it is well known to several Forest Officers, who have spent some years in the locality, it is nowhere placed on record, and in some cases the answers to our questions are still unknown. We find species of local interest and importance which we cannot quickly and satisfactorily determine; we still find it difficult to make even a good guess at the identity of a tree or shrub, unless we have fairly complete specimens of leaf, flower and fruit, the collection of which is troublesome and takes time; we still find it difficult to quickly "run down" and name a piece of some unfamiliar wood which is put into our hands; and finally, when we come to the sylvicultural requirements and characteristics of the various species met with, we find the greatest difficulty of all in discovering what we want to know. What we need to help us is a good "Forest Flora" which will quickly and easily enable us to acquire an intimate knowledge of the various species which compose our forests and of their relations to one another, in the particular locality with which we are concerned. The work of pushing on the preparation of such "Floras" is then one the urgency of which will, I think, be readily recognized by all.

5. We must now consider the question of the material which should be included in such "Floras." They should obviously open with an Introduction, containing a description of the locality dealt with, its climate, geology and principal kinds of soil, an account of the various types of forest vegetation met with, accompanied by a map to show their distribution, and a short description of the past and present systems of management.

6. The very important question of the sylvicultural notes to be included regarding the principal species next claims attention. A great deal of information under this head is stored in the books of Sir D. Brandis and Mr. Gamble, in the pages of the *Indian Forester* and elsewhere, and a great deal more is known to practical Forest Officers, who have had some years' experience in the forests of any one locality, which knowledge is constantly utilized and applied by them in their work. We now require to collect all this material in an easily accessible form and in such a way that it shall be of the greatest practical use. It is as well to first get an idea of kind of details we are most

likely to need. Many of our forests are now worked under a system of coppice-with-standards, and we do not need to stretch our imagination to suppose ourselves being required to supervise a coppice felling shortly after our arrival in a new locality. As we look at the assemblage of plants before us, the following are some of the questions which we at once begin to ask:—

(1) Which species are light demanders and which are shade-bearers?

(2) Which species, being frost-tender, require shelter and which do not?

(3) Which species grow fastest during youth and are likely to oust the others if left to themselves?

(4) Which species reproduce best by root-suckers and which by stool shoots?

(5) In which species does the power of reproduction from the stool cease at an early age, and in which species does this continue, unimpaired, till late in life?

(6) Which species reproduce best from seed and are most suitable standards for seed-bearers?

(7) Which species are the best to leave as standards with the object of shading and protecting the soil from sun and air currents?

(8) Which species retain their leaves through the winter and are most useful nurses with regard to frost injury?

In other words, we recognize at once that the practical Forester must consider the association of plants which compose his forests *as a whole*, and the characteristics of each species, not separately by themselves, as if the plant was an isolated individual, but in their relation to and effect upon the characteristics of the neighbouring plants, all of which combine together to form the forest. What we mainly require then are, clearly, concise lists, in which the principal species are arranged in order according to their relative powers in the above and other respects. We at once think of the excellent lists in Dr. Schlich's *Manual of Forestry*, and we look in vain for similar lists applicable to the forests of the class we see before us.

The silvicultural notes referring to each species might be separately grouped together under the description of that species. It is, however, I believe advisable to confine the details, in these individual descriptions, as far as possible to those which are likely to be useful in helping us to identify the species quickly.

The addition of the silvicultural notes would be apt to confuse these descriptions and render them unwieldy, besides which we should then lose the immense advantage of the lists, which enable us to see and compare at a glance the silvicultural qualities of the various species.

Such lists then must be prepared and should find a place in the Introduction.

Among the lists which would probably be most useful are the following:

- (1) Ruling and dependent species.
- (2) Species which are most and least exacting in the matter of depth and porosity of soil and of moisture in the soil.
- (3) Species which protect and improve the soil and those which do not.
- (4) Frost hardy and tender species.
- (5) Light demanding and shade bearing species.
- (6) Species which attain the greatest height, and least.
- (7) Species which grow fastest and slowest during youth.
- (8) Species which reproduce best from seed and *vice versa*.
- (9) Species which maintain the power of reproduction from the stool until late in life, and those which do not.
- (10) Species which produce chiefly stool-shoots and root-suckers, respectively.

7. It may be objected that these silvicultural details should find a place rather in a "Manual of Silviculture" than in a "Local Flora." The obvious answer is that as yet we have not sufficient data for the preparation of complete and practical "Manuals" of this description, and the details in these "Floras," absolutely essential also as they are for an intimate knowledge of the species, will in a great measure supply this want of information and make the preparation of such books possible when it may seem necessary. At the same time such "Manuals" cannot take the place of these "Local Floras," for the former will almost certainly be of more general application and of wider scope than the latter, and in consequence will be of less practical use to a local officer, for they will necessarily omit much useful detail altogether and obscure still more by placing it in the midst of a lot of information which is quite inapplicable to the locality.

Others may say that it has been the aim of Forest Officers for many years past to prepare such lists as the above, and that we have not sufficient data to enable us to make them now.

I feel sure however that far more is known in this respect than is commonly believed to be the case, and that most Divisional Officers who have had some years' experience of a locality could, in a short time, furnish very serviceable lists for their Divisions, and from these, if necessary, a list could be prepared for each Conservator's circle, or, in some cases, perhaps for two or more circles.

Another consideration which appears to have prevented, to some extent at least, any real progress in this direction up to date, is the existence of considerable differences in the opinions of individual Forest Officers on various important points, and any effort to reconcile these differences and to draw up a statement of important principles, which would be generally accepted as true, has appeared to be so beset with difficulties that it has not been attempted. Many of these differences, however, are almost

certainly more imaginary than real, and many of them could be reconciled if fuller details were known of the facts in each case. In other cases, the different observations recorded about one and the same species are undoubtedly caused by the great variations in climate and other local conditions to which one species may be subjected in India, and the effect of which on individual species is very little known. Finally, it must be remembered that we can never expect complete agreement, for Dr. Schlich, in his *Manual of Forestry*, when giving his scale of light-demanders and shade-bearers, remarks, "Scales have been prepared by various authors, which, though agreeing on the main points, *differ somewhat in detail*" (the italics being mine).

At all events there can be no doubt that the sooner a beginning is made, the sooner shall we have correct and useful lists.

8. Every Forest Officer ought to be able to recognize the wood of any species in his forests which is of economic value, or is likely to be found in use. To help him to do this and to enable him to at once find out the name of any piece of wood he does not recognize, a key to the principal woods must be available, by means of which specimens can be readily "run down" and determined. In the introduction to the new edition of his *Manual of Indian Timbers*. Mr. Gamble gives the reasons which induced him to omit such a key from his book, and he observes, "Consequently, in my opinion, local keys would be much more useful than a general one, and need only take in a few kinds of wood." Such a key, he also remarks, "would not be difficult to make." No more suitable place could be found for such a key than a "Local Forest Flora," the object of which is to give as complete a knowledge as possible of the trees, shrubs and important plants which compose our forests, and it would conveniently come at the end of the Introduction.

9. And here I would urge the necessity of having a set of hand specimens of all the important woods found in each circle, prepared and deposited for reference in the Conservator's office and in each Divisional office of that circle.

Owing to the scarcity of such collections, many Divisional Officers, who frequently have little time or opportunity for collecting such specimens, know little or nothing about their woods.

Such collections, also, would help those who have been trained at Dehra Dun, where they have had the advantage of handling the splendid collection of wood specimens contained in the Museum of the Imperial Forest School, to keep up their training in after years, in default of which aid there can be little doubt that much of the school instruction is rendered abortive.

Finally, there is no doubt that a knowledge of woods is a branch of the scientific Forester's training which appeals to, and

is understood by, the outside public, and therefore is one which we cannot afford to neglect if, in the words of Mr. Gamble, "the Indian Forest Department is to preserve its prestige."

10. Following the Introduction, our "Flora" must contain a Glossary of Botanical Terms and then a Key to the Natural Orders. These call for no remarks beyond this, that although a key to the Orders may be inadvisable in a general work of large scope, it is of the utmost use in a "Local Flora," which refers to a comparatively small and limited area.

11. We now come to the question of the species which should be included. All trees, shrubs and climbers should be included as *prima facie* of importance to Forest Officers, now or in the future. Secondly, all species which are of considerable economic importance must be included, even if they are herbaceous. Thus the economic importance of several species of *Dioscorea*, which are of such immense importance as a food in times of famine, is, in itself alone, quite sufficient to warrant their inclusion, even if they were not also climbers.

Lastly, I believe it is advisable to include those trees, shrubs and climbers which are commonly planted in avenues and cultivated in gardens. Such species are often of considerable economic value and botanical interest, but, apart from this, these are the species which are most familiar to the "man in the street," and although, with lordly indifference, we may say that we do not pretend to be gardeners, etc., still the fact remains that it is not a good thing for the prestige of the Department when a Forest Officer has to be told the name of a common garden shrub or avenue tree by a civilian, or a military man, or, as I once saw to be the case, by a District Superintendent of Police who, bye-the-bye, possessed and studied the *Forest Flora of N.-W. and Central India*.

The little knowledge required in order to become acquainted with such plants is easily and quickly acquired, and is both interesting and useful.

12. Immediately after the name of each species, references should be made to the *Flora of British India* by Sir T. Hooker, to the *Flora of N.-W. and Central India* by Sir D. Brandis, to the *Manual of Indian Timbers* by Mr. Gamble, and, finally, to the new book which we soon expect from Sir D. Brandis. Those who then wish to refer to additional information regarding the species, which it has not been thought advisable to include in the "Local Flora", can easily do so by consulting these books and if necessary others which are referred to in them.

13. Following the references will come the vernacular name. In the Introduction to the new edition of the *Manual of Indian Timbers* Mr. Gamble remarks, "To a Forest Officer with some knowledge of botany and capable of verifying descriptions, a vernacular name may often be useful as helping him to trace quickly the scientific name of a plant met with; but to adopt

scientific equivalents blindly, merely on the strength of a vernacular name given by an often inaccurate native, is a practice which may lead, and to my own knowledge often has led, to absurd mistakes." With this proviso, viz. that they must be accepted and used with caution, there can be no doubt that vernacular names are of very great value in helping one to quickly identify a plant and to discover all that is locally known about it, by conversing with the local natives. There appears to be a tendency nowadays to minimize the importance of vernacular names, and, curiously enough, this is often particularly the case with the educated native classes, among which trained native Forest Officers must be included. I believe this to be a great mistake, and feel sure that this mistrust of vernacular names has been, in many cases, caused by insufficient care being taken to record the names correctly.

14. In the first place, errors are apt to creep in in the spelling of the names. A vernacular name, to be of practical use in any locality, must be spelt exactly as it is pronounced by the natives of that region who use the name, even though the student of etymology may tell us that such names are obvious corruptions, or vulgarisms. It is not, I believe, an unknown thing for the spelling of a vernacular name to be so altered by the philological specialist as to become unrecognizable to the natives who use the name, and therefore entirely useless for our purpose.

Hence, we must endeavour to commit the names to paper exactly as they are pronounced. Here we are met by the difficulty that the ear of the European does not quickly or easily catch the exact sound of a vernacular name when pronounced by a native. As far as possible, when Divisional Officer, I used to keep a literate native with me in the forests. Each vernacular name, after being repeated several times, was then written down on the spot in vernacular by this native and myself independently. If the spelling disagreed, and, after further repetitions of the name, we could not come to an agreement, both methods of spelling were recorded, until further inquiries enabled me to decide which should be adopted.

Of course, no name can in any case be accepted until numerous independent verifications have shown it to be not only correct, but also one which is commonly met with and therefore likely to be of use. Once the vernacular spelling has been finally accepted, the name must be transliterated into English according to a generally recognized system of English equivalents.

15. As noted by Mr Gamble, a native who does not know the correct name of a plant will often invent one for the occasion, but after some practice a good deal can be gathered from the manner, hesitating or otherwise, in which the name is given. If on being asked, a native does not give the name quickly and spontaneously, it is generally useless to continue questioning, or a name will almost certainly be invented,

Again, it must always be borne in mind that even natives who know their trees well are not infallible, any more than we are ourselves, and care should be taken, where possible, to select an example of the plant exhibiting those characters which are most likely to be recognized by the native questioned. A plant, for instance, is often most easily recognized by that part of it which is of the greatest economic use, and which it is to the native's advantage to be able to recognize quickly.

Again, many plants which have a general resemblance to one another in respect of their foliage, are totally unlike as regards their flowers and fruit. In the Jubhulpore Division I have several times recorded *choti* as a vernacular name for *Kydia calycina*, when in leaf, but I have never heard this name given to this species when it is in flower or fruit. On the other hand, it is the common name in this locality for *Eriolaena Hookeriana* when in flower or fruit. These two species, when in leaf, are undoubtedly often confused by natives. The same thing is found with other species, especially the *Grewias*. Leaf examples of several species of this genus are often mistaken for one another, but when in fruit they are usually distinguished at once by a native. In the case of two species which resemble each other, it is, when possible, advisable to ask their names when both species are situated close together, so that they can be readily compared.

16. Many of our Indian trees have a very wide distribution, and, naturally, they are known under a variety of native names in different localities. In our own country we have examples of the same thing, and, as an instance, we may take the common plant *Cardamine pratensis*, which, in neighbouring counties in England, is known as Milkmaid, Cuckooflower, Ladies' smock and Bitter cress respectively, and when we consider the enormous area over which a plant may be found in India, we cannot be surprised at the long lists of vernacular names borne by many of our forest plants.

Here again the great utility of "Local Forest Floras," dealing with a tract of limited extent, will be felt, for they will omit all names which are not used in the locality and will be able to include others which are only found in that region, and most of which have, consequently, been omitted from the larger "Floras." Many of the latter names also will belong to the less known languages and dialects which are the mother-tongue of the forest tribes and which contain many of the best and most fixed vernacular names.

17. In recording vernacular names, we must obviously pay great attention to the personal character of the people from whom we make our inquiries, for this is a factor on which the value of the name given by them to a great extent depends. If we wish to obtain the local name for a plant growing in a Devonshire lane, we should not expect an accurate or reliable one from a man born and bred in the streets of London. Similarly, we cannot expect



reliable or useful information regarding our forest plants from the native who hates the lonely, fever haunted jungle and all it contains, and who yearns for the pleasures of the large bazaar. The people who, whether from choice or from necessity, have from the earliest times made the forests their homes, who have ever depended on the forest and its products for a large proportion, if not indeed the whole, of their daily bread, and who are possessed of the forest lore accumulated by generations of their ancestors, have learnt to know the jungle and its plants as few others can ever hope to do.

It is, however, an unfortunate fact that the higher classes of native Indians appear always to have regarded these aboriginal forest races with contempt; they were believed to be more nearly allied to animals than to the human creation, and nothing that they knew or possessed was considered worth the knowing or the having,—a detailed and extensive knowledge of forests, in short, was nothing accounted of by the educated natives of India—a state of things not absolutely unknown even at the present day in still more civilized countries.

It is, however, impossible to prevent a feeling of intense surprise when one sees a trained native Forest Officer despising these forest tribes and taking no interest in their language, habits, customs and special forest knowledge, although this is undoubtedly in great part due to the prejudice which has been inherited from the earliest times by the native upper classes. This unfortunate prejudice, coupled with the spread of education, is gradually leading to the disappearance of all those characteristics which typified these most interesting races. The upper classes refuse to speak the *jangli* dialect, and the *jangli* native, when brought in contact with them, is driven to pick up the language which is generally spoken and understood, and, as this "education" proceeds, he gradually begins to despise and forsake the ways and wisdom of his forefathers. On page 14 of the little Gondi Grammar published by the Rev. H. D. Williamson, M.A., of the Church Missionary Society, of Mandla, Central Provinces, the following suggestive paragraph occurs, the italics being mine: "The Gond language only possesses numerals of its own up to ten; if it originally had more, no trace of them is anywhere to be found. Above ten the *Hindi equivalents* are used. In the Mandla, Jubbulpore and Balaghat districts, for which alone I can speak, the *Gondi forms for eight and nine have also become obsolete.*" There seems to be no room for doubt that, if things continue as they are now going on, the Gonds as a distinct and well marked race will eventually disappear, and the same thing, no doubt, holds good for similarly situated races in other localities.

This work of compiling "Local Forest Floras," if fruitful in no other way, will have done a great service if it teaches, as it ought to do, the Indian Forest Officer and his subordinates to take a greater interest in and to appreciate more highly these and similar races,

to study their language and their ways, and to learn and place on record all that such people can teach about our forests.

18. Whether or not the Forest Department can or ought to do anything to preserve these forest tribes from extinction is a question altogether beyond the scope of the present article, but a brief reference to the state of things actually existing in some localities may not perhaps be out of place here.

In some Forest Divisions the rules require that a forest guard should be literate, in order that he may be able to read and check the permits under which produce is passed out of the forests. The Gonds, who are often the best material for forest guards in these localities, being illiterate, are debarred from employment except in temporary posts, such as those of fire guards. If a Gond does go to the existing schools, he is taught Hindi and contempt for the Gond and all his ways.

The Forest Department, and through it the Government of India, will gain much if these primitive races can be shown that we value them and their qualifications by enabling them to earn an honourable livelihood, in good official positions in the Forest Department, by virtue of their skill and knowledge as woodmen and foresters.

How often have I seen a local forest guard suffer through comparison with a Gond, whom the former, in his abominable self-conceit, regards as only fit to be his hewer of wood and drawer of water.

On the one hand, the frocked official with the badge of the Forest Department, unable to move in his forests without a guide, ignorant of, and afraid of, the forest and what it contains, and unable to tell one the name or utility of any tree or shrub, for such things form no part of the education of the ordinary Hindu or Mahomedan gentleman, and to talk Gondi he is ashamed!—the man whom the fiery, choking smell of the waterless forests, which cover the rocky hills of the plains of India, as they lie baking in the fierce May sun and swept by the hot weather “dust devils” fills with loathing and malaria.

On the other hand the Gond, and how immeasurably superior has he appeared in respect of his physical strength, his ability to use his axe and clear his path, his powers of observation, his knowledge of the locality, of the local people, flora, fauna and of everything which interests the “Forester.”

This, too, notwithstanding the fact that the forest guard has been duly certified by the Tahsildar, or other Government official, as being “of good moral character,” by the Civil Surgeon as having “no constitutional disease or infirmity,” and by the Educational Department as having satisfactorily passed the “Upper Primary examination in Hindi!”

From what I have heard and seen it appears that a very similar state of things exists in the forests of many localities in India.

19. The next question to be considered is the method of describing the species. The keys, analyses and descriptions of Natural Orders, genera and species will of course be based on those of Sir Joseph Hooker and Sir Dietrich Brandis, and with such help available, little or no original work will be called for, and the descriptions will offer no difficulty.

Before all things, a "Local Forest Flora" must aim at being practical, and it must, as far as possible, help a Forest Officer to recognize his trees without relying entirely on those characters which the systematic botanist depends on for his identification. A Forest Officer wants to be able to recognize his trees at all seasons of the year, when in flower or in fruit, when leafless, bursting into young leaf, in full foliage, or when the autumn-tinted leaves are about to fall, and hence great attention must be paid to those broad botanical characteristics which will help him to do so.

Professor H. Marshall Ward, in his *Notes on Botanical Characters serving to Distinguish the Principal British Forest Trees*, published as an appendix to Vol. II. of Dr. Schlich's *Manual of Forestry*, and which the author explains in a footnote "are for practical use in the forest," and Sir Dietrich Brandis, in the *Forest Flora of N.-W. and Central India*, have shown us, for European and Indian trees respectively, how much can be done in this direction. As illustrating the great utility of such characters, the following few instances may be taken from among the many which might have been selected:—

*Bombax malabaricum*.—"The trunk is straight, the upper part cylindrical, at the base generally with large buttresses, running up the trunk to some distance, and often 5 to 6 feet deep near the ground."

"The branches are in whorls of 5 to 7, spreading nearly horizontally, and forming a broad conical symmetrical head. The branches and stem of young trees are covered with sharp thick-set prickles."

*Bauhinia malabarica*.—"The leaves are acid, and are eaten."

*Gmelina arborea*.—"Bark grey, or greyish brown, smooth, or scurfy, at last exfoliating in broad, irregular, thick, scurfy flakes, leaving exposed the fresh, light-coloured, smooth surface."

*Antidesma diandrum*.—"The leaves turn brick-red before falling \* \* \* are acid, and made into preserve."

*Quercus Robur*.—"Spreading tree with zigzag, gnarled branches. Bark brown and rough, with irregular longitudinal fissures. Young branches silvery grey and smooth; many are cast off. Buds short, rather large, fat, ovoid, scaly and pale brown; tend to be clustered at ends of twigs. Leaves \* \* \* pale olive and apple-green when young, dark and smooth when mature. Young trees tend to retain the dead leaves in winter."

*Fagus sylvatica*.—"Young branches olive-green long smooth pointed, pale brown, scaly buds. When the buds open in May, these long chaffy scales (stipules) litter the ground."

20. The botanical description will of course be given first and the broad botanical characteristics will follow in a separate paragraph, in small print. Here, also, will be noted the season of flowering, of fruiting, of the appearance of the young foliage and of leaf-shedding. A brief description of the seed, mode of germination, the young seedling, the first leaves and of the wood should also be given, when possible.

21. In a second small print paragraph would be included notes on the distribution and mode of occurrence of the species in the locality, giving the class of forest in which it is found, the dimensions attained by it in respect of height and girth, as well as useful silvicultural notes in amplification of, or in addition to, the information given in the lists of the Introduction, regarding the occurrence of seed years, methods of sowing or planting, enemies, etc.

22. A final paragraph, also in small print, would be devoted to the economic uses of the species, particular attention being paid to the uses which are known and taken advantage of in the locality in question.

23. The "Flora" would suitably close with an Index of Vernacular and Scientific Names, respectively, and it may perhaps be possible to include a few plates, from photographs, of typical trees, forest crops and associations of forest plants as found growing together, in a natural state, in the locality.

24. It now only remains to consider the question of the officers by whom these "Local Forest Floras" should be written. Nearly all trained Indian Forest Officers possess the necessary scientific knowledge, enabling them to satisfactorily undertake the preparation of a "Local Flora" on the lines which have been sketched above, and for many of them this would be a great ambition and a labour of love.

In connection with a proposal to prepare local lists of trees, a suggestion was made in the *Indian Forester* some years ago, that these lists should be prepared for each Conservator's circle by the Conservator with the help of another officer, who was to be placed on special duty for the purpose. I believe this to be a mistake. In the first place, as has already been noted above, these "Florals" must be produced as cheaply as possible. And if one officer can do the work, as he certainly could, it is waste of money to have it done by two. At the same time, if one officer alone is to be responsible for the work, he will probably be far keener on it and more likely to produce the best results than if he is to share the credit and responsibility with another. As a rule, it will not be difficult to select a division the forest vegetation of which is fairly typical of the area which it is decided to include in the "Flora," and the Divisional Officer of which would be most suitably entrusted with the work. A Divisional Officer who has had some experience of the locality is in close touch with the people and the forests, while the study of detail required for the preparation

of the "Flora" will help him greatly in his ordinary work and can easily be carried on *pari passu* with his ordinary duties. He would of course be empowered to ask for and receive information and specimens from other Divisional Officers, who would be required to help him as far as possible. His occasional transfer to other Divisions within the area of the "Flora" would probably be necessary in the ordinary course of events, and this would help, rather than impede, the preparation of the "Flora."

To place an officer on special duty for this work is, I believe, unnecessary and has its drawbacks. This would of course increase the cost of production and it would lead to the idea that this work is something outside of, and not concerned with, the daily duties of a practical scientific Forest Officer, and that the men selected for this undertaking are, or are becoming, Botanical Specialists instead of Experts in Forestry.

25. The preparation of "Local Forest Floras" on the lines which have been indicated above will make use of much of the scientific ability which is now latent in the Department, will increase the reputation of the Department as a Scientific Department, will result in the collection of information which will help to elucidate important pending botanical problems, and, finally, will be of the utmost practical use in enabling one to acquire easily and quickly an intimate knowledge of the plants contained in the forests of any particular locality, which is absolutely essential for scientific forest management.

### **The Training of Indian Forest Officers.**

In the January number of the *Indian Forester*, Mr. W. R. Fisher states that a second Forest School on the lines of the one at Dehra Dun is required for the training of the Forest staff of Madras, Bombay, Coorg, Mysore and other Native States of Southern India, to say nothing of Burma, for which an elementary Forest School has already been established.

Mr. Fisher further states that as three-quarters of the instruction at the Dehra Dun school is given in the forest, it is impossible to conduct this work satisfactorily with a large number of students, and adds that the forests of Northern India differ materially from the tropical forests of Southern India.

If the necessity for another Forest School does exist, then, according to Mr. Fisher, either the present instruction at the Dehra Dun Forest School is unsatisfactory, or the school is unable to provide the necessary accommodation for students from Bombay and Southern India.

Mr. Fisher probably does not mean to assert that the instruction at the Dehra Dun school is unsatisfactory, and if he had referred to the Calendar of that school for 1903 he would have perceived that of the 31 students who obtained rangers' certificates in 1903, no less than 11 came from Madras, 5 from Mysore and 2

from Cochin. The same Calendar would also have shown him that of the 60 Upper Class students at present under instruction, 12 came from Madras, 2 from Travancore, 1 each from Coorg, Mysore and Cochin respectively. The Calendar also shows that students from Bombay are now attending the Dehra Dun Forest School, and Mr. Fisher may be interested to learn that the Bombay Government have now abandoned their provincial school entirely and rely on the instruction in Forestry given in Dehra Dun.

The difficulty at present is not to find accommodation at Dehra Dun for students from all parts of India, but rather to find a sufficient number of candidates desirous of entering the school and possessing an education sufficiently advanced to enable them to follow the course of instruction with advantage.

The conditions in Burma are peculiar. The ranger grade is largely recruited from passed private students of the Dehra Dun School, mainly because of the general ignorance of English which at present exists amongst the subordinate ranks of the Burma Forest Department. It is also at present under consideration to change the curriculum of the elementary Forest School in Burma by the issue of rangers' certificates after passing through an English course of instruction.

Lastly, is not Mr. Fisher himself at present occupied in instructing in England youth destined to apply what they may have learned to forests differing vastly more from the forests of Europe than do those of Northern India from those of Peninsular India. Further, may he not at the present moment be endeavouring to illustrate his theoretical teaching with practical examples culled from his extensive knowledge of Northern India, and may not these enter the ears of some unhappy youth destined never to set foot in Northern India, but to languish in Madras. On his remonstrating with Mr. Fisher concerning this apparent anomaly will he not be met with the perfectly legitimate retort, "The general principles of Sylviculture are the same for every country, the practical applications of those principles you must pick up *in situ*." So say we here.

### Plains forests and underground waters.

[Translated from the *Revue des Eaux et Forêts*, by H.]

*Examination of the results.*—

The mean difference of the level of phreatic water is thus

1.10	metres in the first pair	} lower in the forest than outside it.
0.63	" " second "	
1.62	" " third "	
and 1.15	" " fourth "	
		higher in the forest than outside it.

It is in April—May that the underground water is nearest the surface; in January 1901 and August 1901 the level was lowest. At first it seems strange that there should be such a divergence in

the periods of lowest water level, as also in the shape of the curves for May 1900 to May 1901 and May 1901 to May 1902.

The fact is explained by the two following reasons:—

First, the year 1901 was wetter than 1900, and August and September were especially rainy. In the three months July, August and September, 1901, 376.2 millimetres fell at a neighbouring meteorological station (in September alone the fall measuring 163.5 millimetres), while there fell in the same three months of 1900 only 160.8 millimetres (of which 51.3 millimetres were in September). Under the influence of the excessive rain the level of the phreatic waters, which normally continues to fall till November, rose, and did not fall to an equally low figure till the 20th August.

Ordinarily at Nancy, which is 30 kilometres from the forest, September is, after the first five months of the year, the least rainy, but in 1901 it was far more rainy than any of the other months. Although generally rain affects the subterranean water little at this season, there was on this occasion such an excess of rain that the water level in the borings rose from the 20th August to the 21st September, at least in the open ground, where infiltration is quicker, for under forest the level continued to fall.

Secondly. On the other hand, January 1901 was cold and February was snowy and very cold until the thaw of the 24th. So that until this date the water remained frozen in the superficial layers of the soil. Usually, as one sees from the curve of 1902, the level begins to rise from January under the influence of the heavy rain of October, November and December, which are very rainy at Nancy.

The maximum difference of level varies in the several borings, but in every case it is greater in the open ground than under the forest. The forest in this connection plays the part of regulator that we know it to do in the case of temperature.

If we take into consideration the difference of level of the mouths of the borings and reduce them to one plane, the apparent anomaly of the fourth pair disappears. We see from the means given in the table that in all the pairs of borings the water (*plan d'eau*) under the forest is in all seasons lower than under the open ground to the following extents:—

- 0.30 for the first pair,
- 0.20 for the second pair,
- 0.32\* for the third pair, and
- 0.31 for the fourth pair.

It is certain that the variation in level is more marked in reality than these figures show, since we know that in permeable soil the phreatic layer follows the waves of the ground, though in less pronounced undulations.

But let us accept the preceding figures as incontestible minima, the mean of which is thirty centimetres.

We can affirm that at Moudon the level of underground water is, in all seasons, at least 3 decimetres lower under forest than outside it.

This lowering of level is very slight and has nothing disquieting in it. It is sufficient to indicate the general rule for the phenomenon, at least in Europe; but, as I have said elsewhere, and as one might foresee, the action of the forest is proportionately less marked as the trees have more water at their disposal.

In the Russian Steppe Forest, where the annual rain or snowfall is only about 30 centimetres, the first level of the underground waters may be completely exhausted by the forest, as in the case of the forest of Chipoff, where even the second level, where it was not altogether wanting, is very poor and situated lower.

Near St. Petersburg, where the climate is wetter and colder,\*

*Note.	St. Petersburg	Moudon.	where evaporation and transpiration are less active, while the rainfall is greater, the difference in level of subterranean water outside and inside the forest is not more
	c.m.		
Rainfall	... 45 to 50	88 c.m.	
Mean annual temperature	3° to 8°C		
94°C:			
of January	... 9°C	0°58°C	
of July	... 17°C	18°38°C	

than from 0.50 to 1.15 metre.

In the forest of Moudon, where in 1900 the rainfall was 713 m.m. and in 1901 891 m.m., the lowering of the water level is even less. The rainfall is nearly three times that of the Russian Steppe Forests, and, according to Von Höhnel's figures for the transpiration of a beech forest of 115 years' age, this provision of rain water would be double that required by an old high forest for its growth and transpiration.

One understands that in those conditions the water only falls by a few decimetres. With a higher rainfall the difference would tend to disappear.

The comparison of curves suggests also other reflections.

In 1900, 1901 and 1902 the level falls at about the same rate in May, June, July and August, to remount in April to exactly the same point. But in September 1901, instead of continuing its descending movement, as usual, the curve in open ground rises again, because of the extraordinarily heavy rain of September 1901, and does not fall again as low until the 20th August (an unusual date for low-water level in subterranean waters).

Further, as January and February 1902 were very mild, water was able to move in the ground, and the level rose greatly, whereas in 1901 it was frozen during these months, when the level remained very low. From the thaw of February 1901 the water rises suddenly in March in the well in the plantation, which had a large mouth and quickly felt the influence of the surrounding temperature, while the action of the thaw was scarcely felt at the

\* Note —In the table 0.42 is given - (Translator.)



same date in the narrow borings (5 c.m. in diameter), which were moreover corked.

The slower infiltration and imbibition of the forest soil is also clearly shown by an examination of the curves. The maximum, reached on the 20th April 1901, by the water in open ground was not reached till a month later in the forest. Similarly, after the heavy rain of September the water rose under the open ground, but continued to fall under the wooded ground, where it did not reach its lowest mark till the 20th September or even 20th October. But 1902 was also very rainy, and immediately the water rose very quickly in open ground, much less so under the forest. On the other hand, from May to June the descent was rapid in open ground, but under forest the level remained steady.

All these considerations very clearly show the regulating and compensating rule of the forest.

We can see at once that the curves under wooded ground are less marked than under open ground and show less wide variations.

Finally frost and thaw have a great influence. Thus February 1901 was very snowy and cold, much colder than January, and the water is motionless, being frozen. The thaw came suddenly on the 24th February, the snow and ice melt, the abundant rain of March (67 m.m.) and more still in April (130 m.m.) are added, and the water level rises quickly in all the borings. It reaches its maximum on the 18th April in borings Nos. 1 and 2, but only a month later under the forest, where the crowns, the soil covering and the sub-soil, which are drier and more greedy for water, oppose themselves to as rapid a rise in the phreatic water level as occurs under the open ground surface.

#### CONCLUSIONS.

These results arrived at in France near Nancy, agree entirely with the first observations made in Russia, notably in 1895 and 1897, and with those first made at another place in Russia, at the Forest School of Staraja-Russa (in the Government of Novgorod,) near and to the south of Lake Thuen. (All the Russian works which have been translated into French are to be found in the *Annales de la Science agronomique Française et Etrangère*.)

"One is forced to conclude," says M. Tolsky, in his article on this subject, "that the level of underground water is lower in the forest than in the just exploited coupe, in summer as in winter, and that the oscillations are smaller in the forest."

The question, then, seems settled at least as far as Europe is concerned,\* and it may be affirmed that in plains forests in which

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\* NOTE We are careful not to generalise from these results and to say that in all the plains of the globe the forests must have the same effect. It may even happen that the reverse effect occurs, and that the evaporation from uncovered soil has a greater effect than does the transpiration of a forest. This would especially happen in tropical regions with a torrid heat, where the soil evaporates enormous quantities of water in proportion as the temperature is higher.

the soil is formed by the superposition of identical layers with a horizontal stratification, and where consequently the underground sheet of water is motionless :—

1. That the water-level is never higher under forest than under an open ground surface;
2. That the phreatic layer has always been found farther from the surface under the forest than under the ground outside the forest, when the ground section is taken into consideration.
3. That the depression of the level is more marked under old forest than under young forest; and
4. That this depression is more marked also in dry climates than at points where it rains heavily.

In these last conditions it may, as at Moudon, not exceed a few decimetres. Whereas it is not the same thing with transpiration, which is a physiological and not a physical phenomenon. Mr. Ribbentrop has observed an example of this near Madras. It would be extremely interesting to make observations in those regions so as to be able to get an idea of the relations of the evaporation from uncovered soils and the transpirations of forests at all points of the globe.

These conclusions merely corroborate the opinion which has long been held, that forest vegetation has a remarkable faculty for drying up and draining marshy plots. This power that forest has of drying up the soil has been shown by the old examples of the *landes* of Gascony, of *la sologne*, of Marais Pontius, \* and others. The role of the forests in this connection is well known.

Whenever it is required to remove an excess of the stagnant water, recourse is had, and never in vain, to forest vegetation.

Its power of transpiration is proved again by the modification which takes place, up to 1,500 metres, in the air above a large forest.

"The cooling felt by aeronauts when passing over woods," writes in 1900 M. Renard, *Chef de Buttrillon* of Engineers, and Sub-Director of the Central Military Ballooning Establishment, is shown by a marked fall of the balloon. This descent never stops of itself, as happens when some accidental cause has produced it, but continues till a considerable quantity of ballast has been thrown out. As to the height to which this influence is felt, it of course varies with the extent of the woods below, and perhaps also with the altitude and the configuration of the surrounding country. In any case there is this clear fact certified to by many military balloonists, that the influence is felt above the forest of Orleans (a plains forest of 30,000 hectares), when the balloon has been about 1,000 metres up. It seems proved by the whole series of ascents made up to date that the influence of forests of a similar area is felt up to about 1,500 metres".

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\*NOTE.—In the Campagna, at the Convent of St. Paul of the Three Springs at 3 kilometres from Rome, the eucalyptus plantations started in 1870 have lowered the underground water level by several decimetres.

These two facts, the drying up of the soil and the increase in the moisture and coolness of the air above forests are intimately connected. The one is the corollary of the other. It shows that the forest should be considered to be an enormously powerful pump (*pompe aspirante et foulante*.)

Another result of the two facts abovementioned is that it should rain more over a forest than over another area of equal extent but not wooded.

May I add to the examples which I have cited elsewhere a new piece of evidence recently brought forward, and which appears to me to be very strange. I refer to the influence of the forest of Mormal, of about 10,000 hectares, in the Department of the Nord, on the rainfall of the surrounding plain. One reads in a recent article on the rainfall (*pluviosité*) of the north plain of France as follows:—

“ A rather important anomaly is met with at the south side. The precipitations rise rapidly from the Escant (Valenciennes, 705m.m.) towards the Sambre (LeQuesnoy, 795m.m. Gommequies, 907m.m), to fall again beyond the river, *the elevation continuing, however, to increase*: Avesnes, at 183 metres, receives 742 m.m.; Fourmies, at 178m., receives 757 m.m., at Hieson alone, with 196 m., we come again upon more than 800m.m. (806.) *The maximum established upon the upper Sambre, then does not depend only on the elevation. Looking more closely we see that it encloses the forest of Mormal completely in the curve of 850 m.m.* Hence the impression that the forest is the factor of augmentation sought. This influence has been determined by M. Bouvart with great precision in a table in which five stations (Bavai, Gommequies, Loequinol, Landrecies, Maroilles) so placed as to feel the effect of the forest are compared with Le Quesnoy, the base station (*station témoins*) situated beyond that influence. When 737 m.m. fall at the base station, the mean rainfall (*lame pluviale*) of the five above-mentioned stations is (reduced to the level of the base stations) 855 m.m., that is 188 m.m. deeper thanks to the forest. In other terms, it would be necessary to reduce by 16 per cent.\* the heights of the water which fell on this part of the country in order to be able to compare them with the quantities of rain of the neighbouring stations; we should thus obtain about 730 m.m. of rain, a figure which in fact approaches that of Avesnes (742 m.m.) and Fourmier (754 m.m.). Thus is explained the presence, on the upper Sambre, of a maximum bounded on the east side as well as the west side and which precedes to some extent the maximum which we should find further off, on the much wooded heights of the Ardennes. ”

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\* NOTE.—It will be remarked that this is about the percentage found at Nancy, at Luxemburg and in India.

I have already elsewhere shown that this action of the forest on the phreatic waters is not in any way contradictory to the beneficent influence which it incontestably possesses on the underground layer of *moving* waters of hilly countries where flow (*missellement*) takes place, and on the springs which they feed.

In the plains it is the wells and cisterns, not the springs, which provide the water. What does it matter if the water of wells is found at a metre lower down under the forest than under the open ground.

Extremely surprised by the (Russian) results, which seemed to contradict the usually accepted doctrine I wrote to M. Ototsky and others asking various questions in order to have information on the cases cited by the authors and relative to the action of forests upon springs. After having studied nearly all the published documents I arrive at the conviction that the apparent contradiction between facts equally well observed may be explained in part by the considering of the fraction of percolation, and that we must make between plains and hilly forests (where springs are found) a distinction which is necessary from this point of view and which removes all difficulty (*fait cesser toute autinomie*).

Following from the surprise caused by the Russian results the stations of forest research in Germany, Austria and Switzerland elaborated a programme for the observation of the influence of forests on waters.

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NOTE.—Why cannot *we* also elaborate projects for the observation of scientific facts upon which the whole of our work (with its infinitely far-reaching effects) is based. If ever there was a place where the scientific study of the action of forests is requisite, and where, too, it should be comparatively easy, by reason of its comparative definiteness, it is India.

As there is no special Research Officer, however, might we appeal to Forest Officers in, say, Oudh to make a few observations in the sense of this article of M. Henri's. The wells are no doubt generally in clearings (and even small clearings, as M. Henri shews, are sufficient to have effect), but there are some wells, situated right in the forest, and the levels in these could easily be compared, at different seasons, with those of wells just outside forest limits.

## II.—CORRESPONDENCE.

## On Certain Important Forest Questions.

## I.

I HAVE just seen my friend Mr. Gamble's article under the above heading in the November number of the *Forester*. No doubt Sir D. Brandis, and perhaps others, will take up the subject discussed in that article, but there is one point in it on which I must offer a few remarks. Mr. Gamble says :—

"I hope that it will not make the young men now in training at Cooper's Hill or Dehra Dun think that they can dispense with the study of scientific subjects."

The term "scientific subjects" is perhaps used by Mr. Gamble in a somewhat loose manner, but I shall let that pass. As regards the matter itself, I must leave the Officers of the Dehra Dun School to fight their own battle. Here at Cooper's Hill, where I am, practically, responsible for the arrangement of studies, I can assure Mr. Gamble that he has given way to groundless fears. To show the importance which we here place upon the study of science proper I have totalled the hours devoted to the several subjects during the College session of 1902-03, and thus obtained the following table :—

*Statement of time devoted by Forest Students to the study of various subjects during the two years' residence at Cooper's Hill College.*

A.—General Subjects—				Hours.
1.	Geometrical Drawing, Freehand Drawing, Engineering and Surveying	..	..	340
2.	Accounts	..	..	45
3.	German	..	..	120
Total				505
B—Science proper—				
1.	Physics, Lectures	..	..	70
2.	Chemistry, " Laboratory	..	..	90
		..	..	170
3.	Geology, Lectures	..	..	70
	" Excursion	..	..	35
4.	Entomology, Lectures	..	..	30
	" Laboratory	..	..	60
5.	Botany, Lectures	..	..	140
	" Laboratory	..	..	90
	" Excursions	..	..	115
Total				870

**C.—Forestry proper—**

Sylviculture .. .. .	140	
Forest Protection .. .. .	65	
" Utilization .. .. .	65	
" Management .. .. .	120	
" Administration .. .. .	40	
" Law .. .. .	60	
" Excursions .. .. .	196	686
<b>GRAND TOTAL .. .. .</b>		<b>2,061</b>

This table shows that we devote far more time to science proper than to forestry proper (the latter, it appears in the article, Mr. Gamble is inclined to consider as useless subjects!!). Moreover, we insist upon each student's acquiring a certain minimum knowledge in each subject of science proper, failing which he is liable to be sent down and thus lose his provisional nomination to the Indian Forest Department. As far as the study of science proper at Cooper's Hill is concerned, Mr. Gamble has, I fear, indulged in the somewhat useless occupation of "fighting windmills."

W. SCHLICH.

COOPER'S HILL, 27th November 1903.

We cannot agree with Dr. Schlich that Mr. Gamble, in his article under reference, appears to consider Forestry as an useless subject, but rather that he meant to emphasize the fact that a knowledge of certain branches of science is essential to the pursuit of a knowledge of Forestry.

Dr. Schlich has shown that the study of science is far from neglected in the course of instruction at Cooper's Hill, and we give below two tables showing the time devoted to each of the different groups of subjects during the 23 months' course of instruction at the Imperial Forest School, Dehra Dun.

The first table refers to the class which left the Forest School in March 1903, and the second one gives a similar statement for the class which left in March 1899, immediately subsequent to Mr. Gamble vacating the post of Director of the Imperial Forest School.

			Hours.	Hours.
I. A.—General Subjects—				
1.	Engineering, Surveying and Drawing	...	648	} 774
2.	Accounts	... ..	34½	
3.	Mathematics	... ..	91½	
B.—Sciences—				
1.	Botany	... ..	93	} 243
2.	Natural Science	... ..	91	
3.	Entomology	... ..	57	
C.—Forestry—				
1.	Theory	... ..	319	} 902
2.	Practice	... ..	583	
GRAND TOTAL			...	1,919

II. A.—General Subjects—

1. Engineering, Surveying and Drawing	...	634	} 774
2. Accounts	...	33	
3. Mathematics	...	107	

B.—Sciences—

1. Botany	...	84	} 208
2. Natural Science	...	100	
3. Entomology	...	23	

C.—Forestry—

1. Theory	...	274	} 955
2. Practice	...	680	

GRAND TOTAL ... 1,937

These two statements show that more time is devoted to Forestry at Dehra Dun than at Cooper's Hill, but it must be remembered that the '3 months' training at Dehra Dun comprises both the theory and the practice, whereas the theoretical course at Cooper's Hill is followed by a practical training of some 9 months in German forests.

Moreover, the students at Dehra Dun are mostly to be employed in executive work, necessitating a more detailed instruction in the actual carrying out of such works as form a great part of an Executive Officer's duties, *viz.* demarcation, road making, building, surveying, etc.

Mr Gamble, we hope, will see from the two statements that far from neglecting the study of science proper at Dehra Dun, the authorities now devote rather more time to that branch of a forester's education than was the case when Mr Gamble himself presided over and did so much for the Imperial Forest School at Dehra Dun.—HON. ED.

II.

It is not only with a certain amount of indignation but also feeling akin to pity that one reads the abovementioned article in the November number of the *Indian Forester*. It is difficult to understand with what object Mr. Gamble, whose services have been of such use to the Department, has thought fit to issue such criticisms, not only on certain officials themselves, but also on the administration of certain provinces, of which, judging by the statements made by him, he can know absolutely nothing or about which he has been wilfully misled. I have no doubt whatever that the individuals and institutions attacked by Mr. Gamble will find able defenders, but I myself, after 23 years' continuous service in Burma, feel it incumbent upon me to refute the statements and opinions expressed by him regarding the Forest Administration in that province, which opinions I have no hesitation in saying are fallacious and misleading.

Mr. Gamble says: "The selection, demarcation and settlement of permanent reserves or work which elsewhere is completed or nearly so, is still very much behindhand in Burma". This statement can, I think, be most readily met with a few figures.

The area of Burma is put down as 168,550 square miles, 64 per cent. of which is under forest, both reserved and unclassed State forests. This area is divided up into 4 circles, containing 26 forest divisions, each division having an aggregate area of approximately 4,600 square miles of forest, and each containing approximately 700 square miles of reserves. As regards progress made in the selection, etc. of permanent reserves, it seems only necessary to point out, that whereas in 1891-92 the area of reserved forests in Burma was 6,674 square miles; at the close of 1901-02 it amounted to 18,606 square miles, and that the demarcation of these reserves has progressed proportionately is evinced by the fact that at the end of 1901-02 there were only 601 miles of boundary awaiting demarcation, due solely to the fact of its not being possible to demarcate reserves, finally settled at the close of the cold season, during the monsoon.

Mr. Gamble then remarks that "fire protection is in a backward condition," etc., etc. This is hardly correct. The area brought under fire protective measures in Burma has risen from 1,567 square miles in 1891-92 to 5,410 square miles in 1901-02, of which 90 per cent was successfully protected. I quite allow that the results of fire protection in Burma are not so universally successful as they have been made in India, but this, I maintain, is not due to want of energy on the part of the Department, but to other causes which have to be contended against. In the first place, from time immemorial the whole province has been annually traversed from end to end by fire, the straw in the paddy fields is burnt instead of being harvested, forest land required to be brought under cultivation is cleared by fire while probably in India the tree growth would be saved for fuel, grass lands are burnt to encourage new growth and the forests are set fire to to make it practicable to get through the undergrowth and also to procure lizards, tortoises and such like. As a former Conservator of the province remarked, "In no other civilized country in the world would the indiscriminate use of fire as witnessed in Burma be tolerated." Naturally, under these circumstances it is difficult to imbue the executive staff, locally recruited, with the idea that the exclusion of fire can in any way be beneficial; rather the reverse, as it has been conclusively proved that our fire protected reserves are considerably more unhealthy than those forests which are annually burnt. Secondly, the Burman subordinate does not take service under Government for the honour and glory of serving that Government, or with a view of obtaining a pension at the end of his service (in fact I do not know of a single subordinate except one or two who have risen to the provincial service, who is in receipt of pension). But the most important factor against successful fire protection has been and is the want of reliable maps and also the huge areas that the controlling staff are expected singlehanded to supervise.

As regards communications and buildings no doubt we are very far behind India. At the same time nearly half a lakh per



annum is being spent on buildings and a considerable amount also on opening up forest bridle-paths. Roads for the export of material are, and will not for many years to come be, required, and in any case cannot be satisfactorily taken in hand until survey maps of the country are available.

Mr. Gamble then proceeds to accuse us of overcutting our forests as regards teak, with a view simply of raising revenue. Here he is entirely wrong. All felling of teak is regulated either by properly sanctioned working-plans, or controlled by rough working-plans based on valuation surveys (pending the preparation of regular working-plans). In the latter case a most liberal margin has been left to prevent any such overcutting, and Mr. Gamble's quotation of the French Consul's remark is totally misleading.

The export of teak from Burma is to hardly any extent depending on the working of the Forest Department, a very large proportion of it coming from Siam and formerly from Upper Burma, where before the annexation output was totally uncontrolled and the overcutting complained of did most certainly occur. This is most clearly proved by the countings made by working-plans parties at present at work in Upper Burma, and has resulted in the closing to extraction of the many forests formerly worked by lessees.

It is true that at present 2 per cent only of our reserved forests are under management by sanctioned working-plans, but this is simply due to the country not having been surveyed. Survey work in all 4 circles is in full progress now, and next season 8 working-plans parties will be at work turning out plans for 1,200 square miles annually.

Under the orders of Government a regular scheme for the taking in hand of bamboo flowering areas (when it occurs) is at present being drawn up and will be finally sanctioned long before it is required.

Of the timber and fuel extracted during 1901-02, only 150,000 cubic feet came from reserved forests, whereas the unclassified forests yielded over 670,000 cubic feet. In these latter however the more valuable species are protected by a girth limit being fixed below which no timber can be felled.

While giving us credit for encouraging teak reproduction by means of taungyas, Mr. Gamble asks what has been done in those reserves in which teak has been heavily overcut. A perusal of the different Annual Reports would have shown that improvement fellings, i.e. the removal of bamboos and other species suppressing young teak growth, is annually undertaken over large areas. During the last five years nearly 300,000 acres have been so gone over, in addition to all creepers being cut and ficus attacked trees being removed in connection with girdling operations.

As I have pointed out above, the larger portion of our annual revenue is derived from the unclassified forests, the major portion

of which will in course of time be brought under cultivation, and Government is naturally realising the value of the existing stock on the same, instead of allowing it to be destroyed by fire, which would be the ultimate end. There is no doubt that the realisation of this revenue from a clerical and protective point of view, so far as forest offences are concerned, takes up a considerable portion of the time of the Forest Officers in Burma, but I maintain that their energies are not directed to this end to the detriment of more important forest operations. It is the inevitable result of the existing state of affairs in an unpopulated province.

I think I have now said enough to disprove the statement that Forest Officers in Burma are too prone to devote their energies to realising revenue at the expense of their forests, and to show that working under adverse circumstances they deserve credit for the advance made. On the question as to service in Burma being a necessary qualification for promotion, it is only necessary to point out that in almost every instance the higher administrative posts in the Forest Department, not only in India itself but in our colonies and foreign countries, have been and are still being filled by officers selected almost entirely from Burma. I quite agree with Mr. Gamble that Burma may *not be the best place* to come to study the results of fire-protection, road-making, etc., etc.; but I do maintain that service in Burma after a period of the same in India most certainly tends to give a Forest Officer a wider view of administration generally. We are not yet reduced as in India to raising an annual revenue of Rs. 27 on dead teak leaves which has to be collected in instalments.

On the question of "Botany" or "Shikar" being a necessary adjunct of the Forest Officer's existence, I would only say that in my opinion every officer should have a hobby of some kind as a means of relaxation from his lifelong routine work, and if that hobby takes the form of shikar, Botany or Natural History in some form, I feel confident that that officer will see and know more of his forests than the man whose hobby is perhaps stamp collecting or microscopical work. Botany forms part of the Forest Officer's training, and it is very rare indeed to find a man devoting his spare time and obtaining relaxation from his day's work by making a hobby of some part of that day's work. As a rule he prefers to take up some other subject totally unconnected with it.

I only trust that this reply will not lead to an argumentative discussion on the points raised, but Mr. Gamble's remark concerning Sir D. Brandis' careless writing is most certainly applicable to his own article, and it is rather extraordinary that on page 517 of the same number of the *Indian Forester*, Mr. Fischer should remark with reference to a former article of Mr. Gamble's, "so in 1903 we are exactly where we were 17 years ago?"

MAYMYO:

14th December 1903.

T. A. HAUXWELL,

Conservator of Forests.

**Dr. Cooke's Flora of the Bombay Presidency.**

I FIND that there is a slight error under the head of *Bruguiera*, (*B. gymnorrhiza*) in Dr. Cooke's excellent *Flora of the Bombay Presidency*."

For	Should read
<p><i>Bruguiera.</i></p> <p>Fruit, turbinate, thickly coriaceous, crowned at the apex by the lobes of the calyx, 1-celled; seed 1 pendulous germinating as in <i>Rhizophora</i>; protruding radicle, elongate, clavate.</p>	<p><i>Bruguiera.</i></p> <p>Fruit at first imbedded in the turbinate thickly coriaceous calyx tube and surmounted at the apex by the calyx lobes, afterwards protruding, elongate, clavate, 1-celled; seed 1 pendulous.</p>
<p><i>B. Gymnorrhiza.</i></p> <p>Fruit less than 1" long, obconic, crowned at first by calyx segments which afterwards drop off, scarlet; protruding radicle fusiform, more or less angled, often reaching 1 ft. in length before falling.</p>	<p><i>B. Gymnorrhiza.</i></p> <p>Fruit at first immersed in scarlet calyx tube less than 1" long, obconic, afterwards protruding, green, fusiform, more or less angled, often reaching 1 ft. (usually about 6 inches) before falling, the calyx tube and segments remaining pendulous on the apex of the fruit till a short time before it falls.</p>

Having occasion to look for the *Bruguiera* in the mangrove swamps of the Kistna district last month (November), I found it in all stages of flower (bud, and open) and fruit; and on comparing notes, it seemed to me that what Dr. Cooke had described as the fruit was really the sub-persistent calyx tube, and what he had described as the radicle was really the developing fruit. The reasons for my thinking this were: (1) that the green projecting portion was for some time crowned by the style, and (2) that inside this green organ was what was evidently the seed, and in a fruit that I picked up on the sea-shore, this interior seed had germinated by about  $\frac{1}{2}$  inch in length beyond the fruit wall.

I therefore sent specimens to the Reporter on Economic Products, Calcutta, of an unopened bud, a flower after the petals had fallen showing undeveloped fruit sunk in the calyx tube and crowned by the style, a fruit further developed and protruding from the calyx tube, but still crowned by the style, a fruit still further developed protruding still further from the calyx tube out from which the style had fallen, a fruit from which the calyx tube had fallen, and a fruit cut open to show the seed.

The Reporter on Economic Products most courteously sent me copies of drawings from Goebel's *Pflanzenbiologische Schilderung*, and asked me to observe the wall of the fruit pushed out in front of the radicle, and that therefore my surmise

was correct: pointing out, however, that the fruit might be said to be ripe when still imbedded in the calyx tube.

I should think it is rather hard to say the exact stage at which the fruit is ripe, if, by the germination of the seed *inside* it, the fruit itself developed to some eight to sixteen times the size which it is before the germination of the seed commences.

I trust that Dr. Cooke will not object to my pointing this out.  
7th December 1903.

A. W. LUSHINGTON.

### **Parasitism of Sandal Seedlings in Vizagapatam District, Madras.**

THE sandalwood (*Santalum album*) is not a native of the Circars, of the Vizagapatam district at any rate. But having found it doing well some years ago in Ajmere, I got up four seers of fresh seed from Mysore, in October last year, and put the seed down in beds under shade. Only some three hundred young seedlings came up, which I potted and am having put out in different places this year. The nursery was made under a clump of *Eugenia jambolana* trees. When lifting up the seedlings from the beds, I noticed that their young root fibres had already attached themselves to the roots of the *E. jambolana*, little cushions indicating the points of attachment. The connections were always made with the small root-fibres of the *Eugenia* and not with the larger roots. The soil of the seed beds being a more or less stiffish clay, I was not successful in attempting to secure specimens showing the root-attachments sufficiently clearly. However, since the observations were carefully made by me, I have no doubt about the root-connections. There is therefore one more species to be added to the list of 'hosts' of the sandalwood tree already given in the *Indian Forester*. In this connection I also noted that such of the seedlings as had not formed root-attachments always appeared sickly, with scanty yellowish leaves; whereas the others were always vigorous and healthy looking plants. Those in the pots are doing well, although they have no opportunity of forming root-connections with other species, and this I attribute to the leaf mould mixed with the soil in the pots.

GEO. W. THOMPSON.

### **The treatment of *Hardwickia binata*.**

I SEND the following extract from one of my diaries, which may be of interest with reference to Mr. Fernandez's letter on this subject. The date of the inspection of which this extract is a report was 18th February 1903. It will be seen that my observations and conclusions are entirely at variance to those of Mr. Fernandez. The report refers to the Malapanagudi block, situated 10 or 12 miles south-west of Bellary town.

"This block is an interesting one, as it has been under special protection from grazing, cutting and fires for the last

25 years. The result has been that most of the area, which was then, presumably, blank, has been stocked with Yepi (*Hardwickia binata*), which is the principal species of the block. This species now appears on the ground in different aged groups, from old trees down to young seedlings. There are groups representing all ages. From examination of the younger plants it seems to me that it takes at least six or seven years before a seedling really becomes established and begins to grow, till then it dies off every hot weather. Very possibly the necessary time for a seedling to become established is even longer. There are still a few blank areas which remain unstocked, but seedlings are scattered sparsely over these two."

2. As regards the coppicing of *Hardwickia binata* I have had very little experience, nearly all the trees found in the coupes which have been worked being old pollard trees, which it would be useless to attempt to coppice. Until the last two years, as far as I can ascertain, no attempt has ever been made to coppice the tree in this district; but in inspecting a coupe in the Sandur leased forests, which had been felled about two years ago, I found a stump which had been coppiced about 3 inches above the ground but had not been very well trimmed. It had sent out two coppice shoots from well below the ground, both strong and straight, one a little more than an inch in diameter and about 5 ft. high, and the other rather smaller. This will probably be considered very slow growth for coppice, but it should be remembered that the growth of all species is very slow in this dry district.

BELLARY :  
1st January 1904.

H. F. ARBUTHNOT,  
Deputy Conservator of Forests.

### The Commercial Value of Mhowra Seeds.

#### I.

REFERRING to my article on Mhowra seed in the December number, kindly make the following necessary correction:—Page 6, instead of 5,500 cwts. please read 2,000 cwts.

G. M. RYAN.

#### II.

MR. G. M. RYAN, in writing on the commercial value of Mhowra (*Bussia latifolia*) seed, in the December 1903 number of the *Indian Forester*, states that he noticed large quantities of Mhowra trees in the Panch Mahals district. He does not mention whether the trees were healthy and in a flourishing condition, but one may take that for granted. Since he was on famine duty in this district in 1899, the forest growth has been much damaged by drought, and among other species Mhowra has suffered severely.

In two blocks of the Kalol Range, comprising an area of 14 square miles, 11,000 large dry Mhowra trees were marked last

year for felling. The same state of things exists over the greater part of the division, as quite 50 per cent. of this species have been killed outright in the forest during the famine years.

A point worth noticing with regard to the areas in which Mhowra has died is that not 10 per cent. of the Mhowra trees growing on revenue land are dry, whereas the mortality in forest is from 50 per cent. and upwards. The cause of this I put down to the better and deeper soil in revenue lands, and also the soil, being broken up for cultivation, absorbs more of the rainfall, and therefore the greater quantity of moisture in the sub-soil of revenue lands helped to pull the trees through the long dry periods of 1899.

The varying percentage in the mortality of teak in revenue and forest lands is similar to that of Mhowra.

Mr. Ryan, in his article, mentions that bears are supposed to eat the flowers of Mhowra. Of this I am fairly certain, as though I have never seen a bear actually eating the flowers, I have seen their pugs leading round and round underneath these trees at the time the flowers drop. Such pug marks are especially easy to see under trees where the grass has been burnt to facilitate the collection of the flowers.

Any jungle Bhil in Khandesh will tell you that bears get sleepy and drunk after eating Mhowra flowers, but I have no direct proof as to this.

Curiously enough, one of my postmen was held up by a bear in a deep ravine in the Khandesh Satpuras, in the same way as described by Mr. Ryan, but though it was during the Mhowra season, I cannot remember if the bear was supposed to have been in any way excited by having eaten Mhowra flowers.

CAMP MOWRA, PANCH MAHALS:

R. S. PEARSON.

13th December 1903.

### **The influence of Forests on Rainfall.**

CAN you inform me whether there are any statistics available showing the influence of forests on rainfall. It is, I believe, now a more or less recognized fact by the majority of persons that an increase in the density of forest vegetation causes an increase in the rainfall; and it has been ascertained that in certain localities where the forest has been cut away, that the rainfall is considerably less. I wish, however, to obtain, if possible, statistics showing, say:

A.—(1) Area disafforested; (2) rainfall before clearing; (3) rainfall after clearing.

B.—(1) Area re-clothed; (2) rainfall before reboisement; (3) rainfall after reboisement.

Could you therefore inform me whether there are any such statistics available for any localities, and where they could be obtained.

17th December 1903.

A. W. LUSHINGTON.

## IV.—REVIEWS.

**"Bengal Plants," By Major Prain, I. M. S.**

BOTANISTS and Bengal Forest Officers will welcome the appearance of *Bengal Plants*, by Major Prain, Director of the Botanical Survey of India. The book deals with all the plants known to the author to occur in the Lieutenant-Governorship of Bengal (as constituted in 1903), with the exception of the Darjeeling District, i.e. a total area of 186,213 square miles, or approximately one-eighth of the whole area dealt with in the *Flora of British India*. The number of species enumerated are 2,895 or roughly one-sixth of the phanerogamic flora of the Indian Empire (excluding Baluchistan). The undertaking has therefore been a very large one, and in order to keep the book within a size convenient for a pocket flora, it has been necessary to greatly restrict the specific diagnoses. This has been done in preference to curtailing descriptions of families and genera. The work commences with an interesting introduction, devoted especially to the description of the eleven botanical provinces into which Bengal has been divided by the author, and it explains the reason for the exclusion of the Darjeeling district and quotes those botanists who have been active in the elucidation of the flora in each province. Among these, Forest Officers, especially Kurz, Gamble and Heinig, occupy a prominent position, but it is to be regretted that no use has been made of the lists of the more important trees and shrubs which, commencing with Homes' short list for the Sundarbans in 1873, and Dr. Schlich's for Chittagong in 1875, have been drawn up from time to time as appendices to Forest Annual Reports and working-plans. Had these been consulted the omission, for instance, from the Chota Nagpur province of *Vitex leucoxyton* and *Caryopteris Wallichiana*, which occur in the Sonthal Parganas; and the complete omission from the list of the Horse chestnut, *Laportea*, *Linociera macrophylla* and others which occur in the Duars would have been avoided.

The book is published in a paper cover in two volumes, so that it can be bound up in one or two volumes as may be desired, and a map is inserted in Vol. I. On this map, by the way, twelve botanical provinces (omitting Sikkim) are shown, but in the body of the work the Sonthal Parganas are included in the province of Chota Nagpur. As a guide to beginners in Botany there is an artificial key to the genera based on the Linnæan system in addition to the synopsis of Natural Orders. The descriptions of the Orders and genera are very complete. The former are usually in the author's own words. A less free use of alternative characters especially in a work intended for others besides practised field botanists would perhaps have been advisable. Under *Rhamnaceæ*, for instance, the leaves are said

to be alternate or opposite, whereas opposite leaves are exceptional, and the exceptions could either have been mentioned or ignored altogether, as they are not known to occur in Bengal. Under each order a key to the genera is given. The arrangement of these keys is very annoying in practice, owing to the scanty use of letters or other signs to indicate the parallel heads and sub-divisions of the classifications adopted, and the same remark applies to the keys to the species under each genus. The generic descriptions follow very closely those of the *Flora of British India*. In some cases these might have been advantageously modified, e.g. the splitting up of the fruit of *Spermacoce* into "two mericarps, which ultimately dehisce" scarcely fits the case. What actually takes place is that the valves of the capsule partially separate from the septum from above downwards, and the capsule is also partially loculicidally dehiscent. In *Shispidia* one valve separates from the septum sooner than the other. Again, in the genus *Polycorpon* petals are sometimes absent, and in the genus *Urena* the ripe carpels are sometimes (*U. repanda*) dorsally tardily dehiscent. The discrimination of species rests entirely on the keys under each genus, and is of course subject to the difficulties which necessarily ensue when attempting to separate species by one or two characters only. Either species not included in the Flora might be identified with one that is included, or the character adopted may not be sufficiently distinctive used by itself. If, for instance, a specimen of *Hibiscus cancellatus* be obtained with 10—12 bracteoles shorter than the capsule (which actually occurs), it would be ranged under *H. abelmoschus* by anyone relying on the key on p. 263, or again, were the plant only in flower there would be no means of discriminating it either from *H. abelmoschus* or *H. esculentus*.

In a few cases no province or locality is quoted, e.g. *Jussiaea suffruticosa*. There are also a few omissions noted in the index, e.g. *Alternanthera*, *Carex phacota*, *Cephalostachyum*, *Oncilanthes* and *Ficus Roxburghii* are not found there, but on the whole printer's errors are very few and unimportant. The book should be in the hands of all Forest Officers and others interested in Botany in Bengal.

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### **Annual Report of the Forest Department, Jammu and Kashmir State, 1902-03.**

THE area of forests has risen during the year from 2,383 square miles to 2,474 square miles, and the total area of surveyed demarcated forest is 1,580 square miles. The Forest establishment is reported to be far too small to be able to cope with the work, especially with regard to Divisional Officers and Rangers, and in one district it is stated that each subordinate has about 29,000 acres of forest to look after.



The number of breaches of Forest Rules reported is small: 197 cases were prosecuted in court, but convictions were obtained in only about half of this number; the number of cases compounded by Divisional Officers during the year was 185, and the average composition obtained from each offender amounts to Rs.2-12.

As regards fire-protection, the area attempted to be protected, and the cost of protection, are not stated, but 3,230 acres are shown as burnt.

Natural reproduction is gone into in considerable detail, and is shown to be generally satisfactory, except as regards *chil* in Jammu.

Little or nothing has hitherto been done in the way of sowing or planting deodar, and very little success met with.

The total outturn for the year is given as 34,782,652 cubic feet solid, of which 1,848,321 cubic feet represents wastage in conversion, etc., leaving nearly 33 million cubic feet as the net outturn. Of this last quantity nearly 2 millions were removed by State agency,  $1\frac{1}{2}$  millions by purchasers, and over 29 millions under free grants. The net outturn of timber, however, without firewood (which amounted to nearly 30 million cubic feet) was only about  $3\frac{1}{4}$  million cubic feet.

The workings are given in the report for each separate Division, but there are no figures given as totals for the whole State, so it is not easy to ascertain the collective results.

The gross revenue of the year was Rs.8,55,816, and the expenditure was Rs.3,17,913, thus the surplus for the year is Rs. 5,37,903.

Grazing dues are not included in these figures, as they all go to the State Revenue Department.

## VI-EXTRACTS NOTES AND QUERIES.

### Forestry.

AN ADDRESS BY DR. SCHLICH, C.I.E., F.R.S., at the Royal Agricultural College, Cirencester.

IN November last Dr. Schlich, having been recently appointed Honorary Professor of Forestry to the Agricultural College at Cirencester, inaugurated the founding of the new Chair of Forestry and Estate Management by delivering the following address:—

The Council of the Royal Agricultural College has done me the honour of appointing me Honorary Professor of Forestry at the College. It is an honour which I highly appreciate for several reasons. Apart from the acknowledgment of my humble efforts in the cause of extended afforestation and amelioration of existing methods of managing woodlands in this country, I value the appointment especially because it shows that the authorities of the

College fully recognise the importance of forestry. After all, forestry means the employment of land for a specific purpose, and it forms, therefore, part of agriculture in its wider sense. Indeed, it represents an essential part in the management of almost any estate in this country. The Council have, therefore, acted wisely in taking a new departure by appointing a special Professor of Estates Management and Forestry. I had the pleasure this last summer of seeing a good deal of your new professor, Mr. F. McClellan, and I feel sure he will give a good account of himself. (Applause.) There is yet another matter of great importance to which I must refer. The Principal has alluded to the fact that this College is situated close to Lord Bathurst's estate, a great portion of which is under wood. I cannot claim an intimate acquaintance with these woods, but Mr. Elwes was good enough to drive me through them a couple of years ago, and I can assure you that I was most favourably impressed with their condition and the careful management which that condition indicates. Lord Bathurst, I understand, has been kind enough to place his woods at your disposal for educational purposes, and I think the College owes to his lordship a debt of gratitude for his liberality and public spirit. (Applause.) Let us hope that proprietors in other parts of the country will follow Lord Bathurst's admirable example. (Applause.) Thus the College appears to be well equipped to impart that knowledge of forestry which in these days is considered of great importance in the development of the resources of the land, and through it to landowners and land agents, as well as to the labouring classes, because increased afforestation of waste land provides extra work in the shape of managing the woods and in the development of industries. As regards the latter point, let me remind you of the beech woods in the Chiltern Hills, whose existence caused the development of an extensive chair industry, which uses the produce of these forests as its raw material. Tens of thousands of people are employed in that industry, which would never have seen the light of day without those forests. There is every likelihood that similar industries will spring up in other parts of the country if you create the necessary woodlands. On the whole, then, I think the students of this College are to be congratulated on enjoying benefits which are as yet denied to students at other similar institutions. What I have said so far naturally brings me to the question whether extended and improved forestry is of such importance to this country generally as to justify any special measures to be taken towards furthering it. To answer that question is a complicated matter: hence within the short time at my disposal I can only touch on a few of the more important points.

#### REQUIREMENT OF FOREST PRODUCE IN THIS COUNTRY.

The production of timber in this country may be estimated at perhaps two million tons a year, and that quantity has probably

not varied very much during the last 40 years. On the other hand, these islands imported in 1861 about three and one-third million tons of timber, and in 1899 ten millions, making an average annual increase of about 190,000 tons. Here, then, is an important fact. Of the timber imported in 1899 about 87 per cent. was pine and fir, and only 13 per cent. so-called hard-woods. Of the latter, 3 per cent. were oak, and the other 10 per cent. teak, mahogany, furniture woods, house and door frames. Some of these cannot be grown in this country. The centre of gravity of these importations rests, however, in the coniferous woods, and these, or efficient substitutes for them, can be produced in these islands. As regards prices, it may be said that they fell from 1870 onwards to about 1888, owing to the great development of the means of transport by sea; from 1888 to 1894 they were steady, but then a reaction set in, so that the years 1894 to 1899 showed a gradual rise in prices equal to about 18 per cent. Then came the war in South Africa, which caused a temporary check, but during the last 12 months the effects of it have practically disappeared. In my opinion, we shall never again see the low prices of 10 to 15 years ago, because the more accessible forests in the exporting countries have been heavily worked, if not exhausted, so that the timber for export has, year by year, to be carried over longer distances before it reaches the sea.

#### SOURCES OF TIMBER SUPPLY.

Before I proceed to deal with forestry in this country, let me say a few words about the sources whence this timber comes. In 1899 we received from Canada under 2 million tons, from other British possessions rather more than a  $\frac{1}{4}$  million tons, total for British possessions about  $2\frac{1}{4}$  million tons; from foreign countries  $7\frac{1}{4}$  million tons; total 10 million tons. The latter came from the following countries: Russia, about  $2\frac{1}{4}$  million tons; Sweden, about  $2\frac{1}{4}$  million tons; Norway, about  $\frac{3}{4}$  million tons; Germany, rather less than  $\frac{1}{2}$  million tons; France,  $\frac{2}{3}$  million tons; United States of America, 1 million tons. But we are not the only importing country in Europe; on the contrary, most of them import timber. For example, Germany's net imports are  $4\frac{1}{2}$  million tons a year; France,  $1\frac{1}{4}$  million tons; Belgium, over 1 million tons; Denmark, nearly  $\frac{1}{2}$  million tons; Italy, nearly  $\frac{1}{2}$  million tons; Spain, nearly  $\frac{1}{2}$  million tons; Holland,  $\frac{1}{2}$  million tons; Switzerland,  $\frac{1}{2}$  million tons; and Portugal, Bulgaria, Greece and Servia, smaller quantities. The exporting countries in Europe are Russia with 6 million tons; Sweden  $4\frac{1}{2}$  million tons, Austria-Hungary  $3\frac{1}{4}$  million tons, Norway 1 million tons, and Roumania 60,000 tons. If you draw the balance of imports and exports for the whole of Europe, you find that there is an annual deficit of about  $2\frac{3}{4}$  million tons a year, which are supplied by Canada, the United States of America, and smaller quantities from other countries.

## ARE FUTURE SUPPLIES SAFE ?

My reply is, "By no means." To begin with, the timber which we get from Germany is really only a re-export, because that country has a net import of  $4\frac{1}{2}$  million tons a year. It has been known for some time past that Norway is working her forests with a deficit (by cutting more than grows annually). Sweden was hitherto considered as solvent in this respect, but a Parliamentary paper just issued gives a different account. Sir W. Barrington writes from Stockholm to the Marquis of Lansdowne, on the 18th March, 1903: "Recent calculations estimate the annual consumption of timber at some 1,060 million cubic feet, which is said to be about 106 million in excess of normal reproduction." Here, then, is another of our most important sources of supply also working with a deficit. As to Austria-Hungary, very little timber comes to this country, because half their export goes to Germany and the bulk of the other half to various other countries, especially France. There remains, apart from a diminishing supply from Sweden and Norway, Russia. That country has enormous areas under forests, but it has still greater areas without it. Its population is rapidly increasing. Differing views are taken of Russia as to her capabilities of maintaining her export of timber. Some experts say that her resources are inexhaustible, others doubt it. My own opinion, having weighed the evidence on both sides, is that Russia is a somewhat doubtful factor. At any rate, there can be no doubt that the demand is increasing year by year, and that other European countries must reduce their exports. Then as to North America: The United States are no longer a real exporting country, because they import already more from Canada than they export. Thus we are reduced to Canada for making good the deficiency in Europe. That country is supposed to have about 266 million acres of timber lands, and she could, no doubt, supply the rest of the world with the necessary coniferous timber, if her forests were managed in a rational manner, instead of killing the goose that lays the golden eggs. There are also the peculiar conditions of the timber trade, and the great destruction wrought by forest fires, to be taken into account. In summing up this part of the subject it may therefore be said, (1) that we required enormous and ever-increasing quantities of timber, (2) that prices in the future are likely to be higher than in the past, (3) that supplies from outside rest on a very unsafe basis, (4) that the increase of the afforested area in this country, especially by utilising the waste lands, is sure to lead to an increased demand for labour.

## STEPS TO BE TAKEN IN THIS COUNTRY.

It is clear, then, that we must look about and see what we can do for ourselves in these islands. A detailed examination shows that we have plenty of land available for extended afforestation. There are altogether some 25 million acres, or 30 per cent., of the land in Great Britain and Ireland which is either

lying waste altogether or used for rough grazing, apart from their value as shooting grounds. It is, no doubt, difficult to estimate the actual returns yielded by these lands, but I feel sure that I am within the mark when I say it is less than one shilling an acre all round. Some of the lands may yield up to half-a-crown, but enormous areas yield considerably below a shilling, even down to threepence an acre. We may safely say, then, that there is no lack of land obtainable at reasonable and even low rates. As regards the climate, there is practically nothing better to be desired, as far as the production of timber is concerned, however unpleasant it may be in other respects. We have, generally speaking, mild winters and cool summers. Of rain we have plenty, often too much, while snow and ice are not nearly so frequent as in other northern European countries. Unfortunately of gales and strong winds we have more than a fair share, but with proper management their injurious effect upon forest growth can be considerably reduced. On the whole our climate, at any rate up to the centre of Scotland, though it may not be equal to that of a great portion of France, compares very favourably with that of Germany, and there is absolutely no reason, in this respect, why we should not grow as good timber here as is done in Germany. At any rate our climate is considerably more favourable than that of Norway, Sweden, and North Russia, whence we import some six million tons of timber a year. If home grown timber has hitherto been considered inferior to timber imported from those three countries, it is due not to the climate, but to the manner in which it has been grown. Conifers have been too heavily thinned while young, so that they yielded knotty timber with broad annual rings. Only let us grow our timber in the manner followed in France and Germany, the countries which share the honour of having developed the science and art of forestry, and we shall produce the same quality of Scotch pine (the red deal of the Baltic) and Norway spruce (the white deal of the Baltic) as that now imported into this country. It is the non-observance in this country of good sylviculture which is at fault, and not the climate. As regards hardwoods, and especially oak, it is asserted by leading timber merchants that the quality of British grown timber is actually superior to that imported from the Continent, but that the latter comes to us in better shaped cleaner pieces, which again indicates faulty sylviculture in this country. On the whole there is no doubt in my mind that we can produce just as good timber in this country as that now imported from other European countries, provided we put our shoulders to the wheel, and teach our land agents and foresters correct sylvicultural methods. At the same time we must not expect immediate results in all cases. In only too many instances the land has suffered in yield capacity owing to continued exposure and the subsequent dissipation of all organic matter. In such cases there will be some difficulty in the

beginning, but if once more a suitable forest crop has been established on the areas, the producing powers of the land will increase in the same degree as organic matter accumulates in the soil. The loss of increment in the beginning is a penalty which we shall have to pay for neglect in the past.

#### FINANCIAL ASPECT OF BRITISH FORESTRY.

The next question you are likely to ask me is, "Will it pay to put land under forest in this country?" In answering that question we meet with great difficulty. Most naturally you would say, "Let us inquire what the results of forestry have been so far." That inquiry would lead to disappointing results, because in the first place it is almost impossible to obtain, in this country, data which would conclusively prove the case either one way or the other; and secondly, we can only estimate what the effect would be if rational silvicultural methods were applied to the industry accompanied by a more systematic management. As regards the first point, I must point out that those data which are available are almost invariably vitiated by the fact that many items are included under expenses which have little or nothing to do with forestry by itself. For instance, you find heavy payments for fences which ought to be charged against shooting rents or enjoyment of the chase, or even against the cultivation of adjoining land, to keep the cattle out of the woods. In other cases, fancy roads are kept up for the benefit of the proprietor. As regards the second point, I have no hesitation in saying that the returns might in many, if not in most, cases be doubled by following the rules of rational silviculture and by systematic management. Let me give you an illustration of the latter point.

#### THE EXPERIENCE OF SAXONY.

There is probably no country in the world which has such complete records about the past management of woods as the kingdom of Saxony. That state possesses 428,000 acres of Government forests, which occupy good, bad, and indifferent land, less of the first and more of the last. The forests go up to 3,000 feet above the sea. The systematic management of these forests was commenced rather more than a hundred years ago, and we have authentic records since the year 1817, which show that the yield in wood in 1817 was 61 cubic feet per acre, and in 1893 it was 92 cubic feet, an increase of 51 per cent. At the same time, growing stock in 1814 amounted to 2,173 cubic feet per acre and in 1893 to 2,658 cubic feet, or an increase of 22 per cent. The net return, after paying for all items of expenditure, amounts to: In 1817-26, 4s per acre; 1827-36, 4.2s.; 1837-46, 4.7s.; 1847-53, 6.3s.; 1854-63, 10.0s.; 1864-73, 14.8s.; 1874-83, 17.5s.; 1884-93 18.4s.; in 1900, 22.5s. It has of course to be borne in mind that the average value per cubic foot of wood in 1817 was 2.1 pence and in 1900 it was 4.5 pence, equal to an increase of 114 per cent. But the increase of net receipts was 463 per cent., or four times greater

than the increase in the value of the wood, due to improved management. Remember, these figures refer to the whole of the Saxon State forests, and not to any specially picked out case: There are forest districts in Saxony which give double the above-mentioned net revenue.

#### OBJECTS OF MANAGEMENT.

The management of forests depends on the objects which it is proposed to realise. It rests with the proprietor, in so far as his choice is not limited by the laws of the country, to determine in each case what these objects shall be, and it then becomes the duty of the forester to see that they are realised to the fullest extent, and in the most economic manner. Here you have the fundamental principle in a nutshell. In these islands nearly the whole of the woodlands belong to private proprietors. They desire, in the majority of cases, to have the woods so arranged that they either lend themselves to landscape beauty, or to the rearing of game, or to the production of a particular kind of produce required in the management of estates. Either one or more, or sometimes all these objects, have to be kept in view. Where this is the case, the economic working is sometimes altogether out of the question, or at any rate, considerably interfered with. And yet, even in such cases the objects of the proprietor may be realised, and the woods can be made to yield, if not a full, at any rate a fair return, while the proprietor must put down any deficiency in the return against his pleasure, or against shooting rents, or the benefits derived by the rest of the estate.

#### ECONOMIC FORESTRY.

Where, however, the manager is not hampered in this way, and where economic forestry is aimed at, as it would generally be in the case of extended afforestation of waste lands, the question of finance would stand in the foreground. The forester must decide what to plant, how to plant, and how to treat his woods, so as to realise the highest possible net returns. The answers to all these questions involve practically a treatise on silviculture and forest management, which your professor will no doubt propound to you. On this occasion I can only offer a few general remarks. The financial results may be said to depend chiefly on (1) the soil you have to deal with, (2) the average annual production of the several species, (3) the value per cubic foot of timber, (4) the cost of planting and subsequent treatment, (5) the degree to which the trees are exposed to injury, and last but not least the rate of interest on the money invested in forestry.

#### RATE OF INTEREST.

It has been said in public by an eminent botanist "that no British landowner will invest money in forestry, unless he is assured of 4 per cent. on his money." But, I say, is this reasonable? What other investment of equal security gives 4 per cent.

in these days ? Does agriculture proper give 4 per cent. ? Why should forestry be expected to give a higher per cent. than agriculture ? Let us consider the case of consols for a moment : they give nominally  $2\frac{1}{2}$  per cent., but look at the ups and downs which they undergo. A few years ago they stood at 112, now they are quoted at 88, a fall which represents ten years' interest. Such fluctuations do not occur in forestry. Once that industry has been established on a safe basis, it yields a steady income, and the capital is safe from anything like the fluctuations to which consols are subject. In my opinion forestry, conducted on proper lines, offers an investment at least as safe as consols, and it seems to me unreasonable to expect more than  $2\frac{1}{2}$  per cent. from it. There are millions of acres in these islands fit for planting which are valued at such a low rate that they can be made, if put under forest, to yield steadily  $2\frac{1}{2}$  per cent. and more. At the same time, I must lay stress on the fact that all forest operations must be conducted in a truly economic manner. Extravagance has no place in forestry or in agriculture either.

#### SOIL.

In coming to the question of soil, I desire to impress upon you this fundamental rule : "Never attempt to plant a species which is not thoroughly suited to the locality, that is to say, soil and climate." Every disregard of this rule is likely to lead to financial loss. It is quite astonishing how often this rule is sinned against. Sometimes the planter has not a sufficient understanding of what is the species most likely to thrive best in a given case. This shortcoming must be met by proper instruction, such as you will, henceforth, no doubt receive at this College. In other cases the planter has developed a fancy for a certain species and he proceeds to plant it under all circumstances. This is a most disastrous failing, which the forester must combat with all his might. The subject must be approached with an open mind, and all personal fancies must be absolutely put on one side. No doubt the selection of the right species is a very difficult task, and the subject must be studied in detail. As a general proposition it may be said that "heavy soils are better adapted for broadleaved species, and lighter soils for conifers." This rule is, however, not without exception. Spruce, for instance, does very well on heavy soil. There is a medium class of soil which I shall call loam, which practically suits any of our forest trees ; in the same degree as you proceed to heavier soils, the conifers retire, and *vice versa*. Again, some species, to do really well, require a fertile soil, like sycamore, ash, oak, and elm ; others are somewhat less exacting, like chestnut, beech, and silver fir ; next come Norway maple, lime, alder, larch, and spruce ; less exacting again willows, poplars, birch, Weymouth pine, Scotch and Austrian pine. There are, of course, many other points to be considered, and the forester must make his choice accordingly.



## AVERAGE ANNUAL PRODUCTION.

We have as yet in this country very few data which throw light on the possible average production of the various species. The matter is complicated by the fact that certain species grow fast from the very start, while others grow slow at first but make up for it by growing faster later on. Both in Germany and in France the collection of statistics on the question under consideration has, during the last 20 or 30 years, been most actively prosecuted, so that a great mass of information is now available, although it is not yet complete. We have now tables giving detailed information of the progress of woods of beech, Scotch pine, spruce and silver fir; provisional tables for oak, larch, and some other trees. The best available data show that on a locality of average yield capacity in the use of each species, and under proper silvicultural treatment, larch and ash give the greatest average production under a rotation of about 70 years. Scotch pine under a rotation of about 80 years; spruce 90 years; beech and silver fir 120 years; and oak, 130 years. On fertile soil the culmination occurs earlier and on inferior soils later. If worked under that rotation we can count on an average production in the way of timber as follows; ash, about 40 cubic feet per annum; oak, 46 cubic feet; beech, 57; Scotch pine, 70; larch, 73; spruce, 84; and silver fir, about 111 cubic feet per annum. Placing the value per cubic foot for oak and ash all round at 1s. 5d; beech 11d., larch 11d., Scotch pine and silver fir 8d., and spruce 7d., larch gives the highest annual money production and spruce the lowest. But it must be remembered that the mean annual production culminates at different periods, that of oak being as much as 130 years, whilst that of spruce is 90 years.

## THE COST OF PLANTING.

Economy in planting is of great importance because compound interest on the original outlay must be allowed for a long period of time. Generally speaking the cost of planting is greater in the case of broad-leaved trees, such as oak, ash, and sycamore, and smallest in the case of conifers, such as larch, Scotch pine, and spruce. The exotic Douglas fir makes an exception, because its seed is as yet expensive. For argument's sake we may place the cost of planting an acre with spruce at £3 10s.; Scotch pine, £4; larch, £4 10s.; beech and silver fir, £5; oak and ash, £6. Charging compound interest at the rate of  $2\frac{1}{2}$  per cent., we find that the cost of planting amounts at the time of cutting over the wood, in the case of larch (at 70 years) to £25; Scotch pine (80 years), £29; spruce (90 years), £32; ash (70 years), £34; silver fir (120 years), £97; beech (120 years), £97; oak (130 years), £149.

## VALUE OF SOIL FOR FORESTRY.

I cannot take you through all the intricacies of the calculations, but I may say, that based upon the above considerations, and additional data, which I cannot now place before you, I have

calculated the amount which a proprietor may pay for land if he wishes to plant certain trees and get  $2\frac{1}{2}$  per cent. on the invested capital. I have, then, to keep on the safe side, deducted 25 per cent. from the amount thus obtained, and I find that he may pay for his land the following sums per acre: for planting oak, £9 11s.; beech, £9 17s.; Scotch pine, £14 5s.; spruce, £15 1s.; silver fir, £16 6s.; ash, £24; larch, £34 2s. That is to say, if he obtains the land at a lower rate, he gets more than  $2\frac{1}{2}$  per cent. on his investment; if he pays more, he gets less than  $2\frac{1}{2}$  per cent. You will observe that larch pays best by far, ash comes next, while oak stands last.

#### EXTERNAL DANGERS.

Here the hardwoods have a decided advantage as regards insects, fungi, fire, gales, etc. Spruce and Scotch pine are especially exposed to insect attacks, also to fungus attacks, but the most serious thing of all is the liability of larch to be attacked by the canker produced by *Peziza Willkommii*. Indeed, this fungus has now spread to such an extent in these islands that few places will be found where it does not occur. The appearance of this fungus makes the planting of larch in future highly problematic. Great efforts have been made to get at the bottom of this disease, but the results are, up to date, not satisfactory. The *Peziza* is a wound parasite: that is to say the tree must have been injured in some way, to break the bark and let some sap flow out, to enable the spores of the fungus to germinate. Different opinions are held as to how the injury has been caused. Causes have been given as damage by frost, the attacks of the aphid *Chermes laricis*, hail, wind, and what not. Dr. Massie, of the Royal Gardens at Kew, has lately published an article on the subject in the "Board of Agriculture's Journal." That article does not contain much which was not known before, but it contains one view which I do not consider correct. Dr. Massie maintains that the disease is chiefly due to the damage done by the aphid, inasmuch as the canker generally commences somewhere around a branch, and the aphid mother settles in the angle of the branch with the main stem. This is very ingenious, and I have no doubt that the attacks of the aphid may cause the damage. But, on the other hand, the canker appears where there is not an aphid within miles around. I have just condemned and cleared away a larch wood 17 years old because it was ruined by canker, and I have never seen an aphid within five miles of the wood, although I have watched it for the last eleven years. My personal opinion is that we have not yet got to the bottom of the matter, but that probably snow, ice, and wind have more to do with it than the aphid. If heavy snow or rime settles on the tender branches they are pressed down and probably small rents are caused where the branch joins the main stem. Sap flows out, and gives the spores the means of germinating. It is not improbable that strong wind causes the damage. Unfortunately the

result is that the pure larch woods must be given up. The only way to proceed is to plant a sprinkling of larch into other woods. In that case it has a better chance of escaping the disease, and if not it can be cut out in the thinning without ruining the rest of the wood.

#### INDIGENOUS TREES *versus* EXOTICS.

To sum up, in my opinion the best plan in economic forestry in this country is: Plant ash, sycamore, and oak on lands which are thoroughly suited to it, and conifers, such as Scotch pine, spruce, Corsican pine, and perhaps others on the rest, in either case with a sprinkling of larch. On wet lands, probably, poplar pays best. There can be no doubt that it is desirable to make experiments with such exotics as are likely to suit our climate and soil, but we must be careful not to be carried away by enthusiastic recommendations. It stands to reason that the indigenous species have stood the test of climate, soil, and other conditions, and we know what we may expect of them. Planting exotics, except on an experimental scale, is always a risky matter, until actual experience has shown decided results. And that takes, unfortunately, a long time. There is no knowing what diseases exotic trees may develop, and I think the case of the larch is a case in point. Still the larch has done us good service, at any rate for a time, and there are other exotic species which may do the same. Amongst the latter the three most promising are the Douglas fir, the Weymouth pine, and the Corsican pine. The last-mentioned produces a straighter stem than *Pinus sylvestris*, and suffers less from rabbits. The Weymouth pine gives heavy crops of timber; it is the species which yields the Canadian white pine. Above all, however, the Douglas fir deserves attention. There are two varieties of it, the Atlantic or Vancouver variety, and the Colorado variety. The former is a marvellously fast grower, but it is not quite so hardy as the other. The Vancouver variety is to be recommended for the South and West of England and Ireland; the Colorado, or slower growing variety, for the North of England and for Scotland. The Douglas fir gives a yield that beats the larch in its palmiest days, and I may mention a wood of it on the estate of Lord Ducie which made a most favourable impression upon me. There are, no doubt, other exotic trees which deserve attention, but as I have said already, we should be careful to avoid planting them on any considerable scale until actual experience has shown that they are superior to our indigenous trees, for, as the old proverb puts it, "A bird in the hand is worth two in the bush."

#### IN CONCLUSION

Dr. Schlich said forestry was an industry based upon science. It could not be studied in the class room only, but there must be instruction and observation in the forest. The treatment of woods differed with every change of conditions, and it was necessary to observe the development of their woods from the time the seed

was laid down till the wood was finally cut over. Above all, continued action and treatment were essential. The want of these had been one of the principal causes why the industry of forestry had not been more developed in this country. However, there seemed to be a little forward movement going on now. Lord Onslow's predecessor appointed a committee some 18 months ago which had led to the provision in the first instance of instruction for those interested in the forestry industry, such as proprietors, land agents, and woodmen. That would be developed at that College, and he hoped similar measures would be taken by other agricultural colleges in the country, and also by our leading universities. Steps had also been taken by the Commissioners of Woods for the instruction of woodmen and forest men on a small scale in the Forest of Dean, where the men received instruction on two days and worked the other four. He wished the students before him all success in the prosecution of their studies in that new branch of work, and he thanked them for the way they had listened to his humble endeavour.

### **The Advance of British Forestry.**

THE question of British reforestation is centuries old, and from time to time, when the necessary interest to keep it alive has been on the wane, enthusiastic individuals have come forward, and by their fervent efforts have resuscitated it to something like its proper importance in the commercial affairs of the country; but, unfortunately, as soon as their influence has passed away, the fires have been extinguished, and the whole question has lapsed once more into a condition of almost complete public and national unconcern. But the movement which commenced some two or three years ago has apparently taken deeper root, and interest in British forestry is increasing every day. Three forestry societies, which are continually enrolling fresh members, are already in existence, and another is proposed. It was only last week that the establishment of a school of forestry was determined upon for Wales. Our agricultural colleges have for some time had their forestry departments, and the Government have formally recognised the importance of the movement by holding the recent forestry inquiry under the auspices of the Board of Agriculture. To crown the work, and to put into practical shape the many suggestions and proposals which have been gradually crystallising, it is now decided by the Royal Agricultural Society of England to hold a British Forestry Exhibition next year in connection with the annual agricultural show. The following letter appeared on the 28th of November last in the columns of the *Field*:—

Sir,—Upon the recommendation of their Education Committee the Council of the Royal Agricultural Society of England have decided to hold a British Forestry Exhibition in connection

with the society's annual Agricultural Show of 1904, to take place at Park Royal, Willesden, London, N.W., from June 21st to 25th next. A special Forestry Committee, consisting of members of the Council and other forestry experts, has been appointed to organise the exhibition. As chairman of the committee, I am desired by my colleagues to invite the principal institutions engaged in the promotion of scientific forestry, owners of forest and woodland areas in Great Britain, and others, to lend their active co-operation in the endeavour to make the exhibition complete and thoroughly representative of British forestry. The space at the disposal of the society being limited, the committee will endeavour to make such a selection, without duplication, as will be representative of the whole subject of forestry. With this object they propose that the exhibits shall be classified in several sections as follows:—

I.—Seeds and cones of forest trees Sowing appliances.

II.—Seedling trees and transplants, showing the effects of nursery treatment as to cultivation, manuring, root pruning, &c.

III.—Woods and plantations, chiefly photographs and diagrams, showing systems of treatment as to mixing, thinning, &c. Photographs of historic or specimen trees.

IV.—Timbers, hand specimens of homegrown woods of various species; also specimens showing the effects of pruning, injuries, &c.

V.—Insects and diseases. Specimens of forest insects and of fungi and their ravages. Characteristic examples of the attacks of game birds, squirrels, voles, &c.

VI.—Plan maps, models, &c., illustrating working-plans; forest exploitation, manipulation of timber, &c.

VII.—Forest and nursery tools, instruments, and appliances.

The committee would be glad if attention were given to comparative exhibits, *e.g.* specimens of young trees showing the bad as well as the good effects of nursery treatment, specimens of timber and photographs showing the effects of proper and improper pruning, dense and open stocking, &c. It would also be useful to have fresh branches, leaves, &c., of nearly related species that are apt to be confused; *e.g.*, species of pine, spruce, fir, larch, thuya, oak, maple, ash, &c. Specimens of exotic timbers that cannot be produced in this country are not desired; but foreign-grown specimens, to be placed alongside of homegrown material, will be welcomed. Objects and plants of purely horticultural interest are not desired. The society will provide the necessary staging and shelter for the exhibits; but exhibitors will be asked to arrange for the delivery of their exhibits without cost to the society and in good condition for their proper inspection by the public.

The Forestry Committee will meet again on Monday, December 7th next, for the consideration of replies to this letter; and it would be of great advantage if replies were posted

before the end of the present month. Any general suggestions for the organisation of the exhibition with which I may be favoured for the consideration of the committee, will be welcomed. Replies may be addressed either to me or to the secretary of the society.

(Signed) GRANBY, Chairman of Forestry Committee, Royal  
Agricultural Society of England.  
13, Hanover Square, London.

—*Timber Trades Journal.*

### **Proposed School of Forestry for Wales.**

WHETHER the fiscal policy of this country has been remodelled on lines as at present suggested by Mr. Chamberlain, or whether the country maintains its career of "free trade," future generations in Wales will have cause to thank Mr. Edward Robinson, timber merchant, of Boncath, for his endeavours, if they meet with the attention and success they deserve, to foster arboriculture in the land of the leek. Some few months ago Mr. Robinson set on foot an important movement which had for its main object the establishment of a school of forestry for Wales. Through his own Council (the Pembroke County Council) Mr. Robinson sought the co-operation of other Councils in Wales, who were asked to appoint delegates to attend a joint conference for the discussion of this pressing question. The meeting accordingly took place on Friday last week at the Shire Hall, Haverfordwest, at which delegates from Pembroke, Cardigan, Carmarthen and Monmouth were present, the other Councils who had fallen in with the movement, but were absent probably owing to the uncentral venue, being Glamorgan, Brecon, and Merioneth. Mr. Robinson explained that the object was the planting of waste and at present unproductive woodlands in Wales. A school could be established with 100 to 200 acres of land to start with, and the option of acquiring a further 500 or 800 acres, and the total capital outlay at the outset ought not to exceed £5,000 to £8,000, which could be contributed by the councils according to their rateable values. It devolved upon the councils to take the matter up, for the Government had not yet acted on the recommendations of three committees on the subject. He believed the Government would contribute about half the amount required, and he assumed that an annual grant of £100 or less from each of the councils would be sufficient to cover all out-of-pocket expenses and give a good return on capital. There were about a million acres of waste land in the Principality which could grow timber. Of the owners half might require assistance, and the planting would cost not more than £6 an acre. Spread over 30 years that would require a yearly grant of £100,000 from the Government, the money to be repaid in that period by half-yearly instalments, and by the end of that time they should have plantations worth from £30,000,000

to £40,000,000. In the whole country there were 21 million acres of waste land and quite eight millions suitable for planting, which in 50 years would be worth fully £650,000,000 sterling. At present we depended on foreign countries for our timber, whilst at least £8,000,000 per annum might be saved if our waste lands were properly afforested. It was proposed to teach forestry on a very limited scale at Aberystwith College, but what was wanted was a bold and comprehensive scheme. Mr. Robinson's resolution, "That it is desirable to establish a school of forestry for the whole of Wales and Monmouthshire," was carried unanimously.

We are glad to see that another conference is to be held shortly, at Swansea, in the meantime Mr. Robinson's address, of which we have given a summary above, is to be circulated amongst the County Councils of Wales.—*Timber Trades Journal*.

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THE NEW YORK STATE COLLEGE OF FORESTRY.—From the *Forestry Quarterly* for November 1903 we learn that the New York State College of Forestry has been closed. The ostensible reason for the closure would appear to have been the vetoing by the Governor of the State aid without which the University was not in a position to continue the College. From our contemporary it would appear that the Governor's veto was obtained, directly or indirectly, by persons who did not approve of the logging operation, adopted on the College tracts, the full details of which are unknown to us. Be this as it may, the sudden and early closing of the College is a backward step in the forestry movement in America, which we hope will not find a counterpart in a similar closure of Cooper's Hill.

MIDLAND REAFFORESTING ASSOCIATION.—Sir Oliver Lodge presided over a meeting of the Midland Reafforesting Association, held in Birmingham University. Encouraging reports were received as to the attitude of the public towards the scheme for reafforesting the Black Country. It was resolved to take steps to establish a demonstration plantation to show the practicability of tree-growing on the waste lands of the pit district. A resolution was passed in favour of the promotion of an "arbour day." Mr. L. Hodgson, moving a resolution that local authorities be communicated with regarding the rating of land planted with trees, expressed a hope that Parliament would relieve forest lands of the heavy rating to which they were now subject, and which was greatly restricting the growing of timber in England. He was convinced reafforesting conducted on economical lines could be made commercially successful. The resolution was carried. Sir Oliver Lodge urged the importance of enlisting the co-operation of local communities, and a resolution was passed with a view to organising localities.

## VII.—TIMBER AND PRODUCE TRADE.

## Churchill and Sim's Wood Circular.

1st January 1904.

**EAST INDIA TEAK.**—The importation of timber and planks has been:—

	1897.		1898.		1899.
	20,428 Loads		18,083 Loads		12,835 Loads.
And the deliveries...	18,410 "		18,526 "		17,017 "
1900.	1901.		1902.		1903.
15,024 Loads	12,860 Loads		8,762 Loads		14,658 Loads.
11,053 "	13,807 "		12,598 "		11,888 "

The teak market has continued to be rather out of joint during 1903. The importation to London has exceeded the average of the previous three years, but it has been very miscellaneous. The deliveries have fallen short even of the average of the same three years, and will, of course, in no way compare with the old deliveries in the years before 1900. The long continued cessation of regular dependable supplies from Burma and Siam, which seems little nearer its termination than it did twelve months ago, has upset the whole course of the trade, breaking up its channels and dissipating the force of its steady flow. Buyers who cannot replace their stocks and sellers who cannot quote for buyers' requirements both turn their minds to other matters, and the teak trade suffers accordingly. This ill-wind has, however, blown good to the trade with Java. The teak from that country has been largely and profitably introduced into the London market, and to a less extent to other British markets, during the past year. There is little intrinsic fault to be found with the wood even when compared with the best Burmese and Siamese productions. The Dutch shippers and merchants have made commendable and successful efforts to bring the classification and manufacture up to trade standards, and there seems little doubt that this wood will form a permanent addition to the sources of supply for the future. There will be room for all directly a return to normal conditions once more stimulates the ever-increasing demand for this valuable and satisfactory wood. Market prices during the year, while uniformly at a high level, have been easily influenced in either direction by small local and temporary causes.

**ROSEWOOD—EAST INDIA.**—The imports were again larger, but the consumption is steadily increasing, and the stock remaining on hand is small. Good logs sold well and without difficulty, but inferior wood was not so readily placed. Several parcels of planks came forward and found buyers at fair prices, although logs are much more saleable than planks. Prices were steady, with a gradual upward tendency, and with moderate imports are not likely to recede. Quotations are from £7 to £12 per ton for fair



to good parcels. The landings, &c., of East India wood have been :—

	Landings		Deliveries.		Landed stock, 31st December.
EAST { 1902 ...	Not recorded	...	Not recorded	...	53 tons.
INDIA { 1903 ...	536 tons	...	517 tons	...	72 "

**SATINWOOD—EAST INDIA.**—The import was rather less than that of the previous year. There was a fairly steady demand for plain logs, especially towards the close of the year, when they realised good prices ; for really finely-figured logs high rates were obtained. There is a fair stock on hand, but it consists chiefly of so-called figury logs, the value of which is over-estimated by shippers, and consequently the wood remains unsold, as their expectations are unobtainable. Quotations are from 7*d.* to 18*d.* per foot.

**EBONY—EAST INDIA.**—There was a considerable increase in the imports, some of which were very inferior ; the demand fell off, especially in the latter half of the year, and prices weakened ; the supply on hand is quite sufficient. Quotations are nominally from £6 to £10 per ton.

**PADOUK—EAST INDIA.**—The import was again small, and mostly of a poor character. The active demand for good logs was unsupplied, and, being still wanted, they would sell readily, but inferior wood is not easy to clear. **AFRICAN.**—There was no import to meet the demand for this description, which was good until quite the close of the year, when it fell off in America, buyers there having secured sufficient stock. Quotations for East India wood are from 5*s.* to 6*s.* and for African from 4*s.* to 5*s.* per foot cube.

### **Denny, Mott and Dickson, Limited.**

#### **WOOD MARKET REPORT.**

*London, 1st January 1904.*

**TEAK**—The modest supplies of this wood at the Burmese and Siamese shipping ports at the commencement of 1903 enabled shippers to enforce increased rates during the year, notwithstanding that, owing to such increased cost and a falling off in the building of ships of the class requiring teak, the consumption shrank to 52,000 loads as compared with 67,400 loads in 1902, or an average consumption during the previous five years of 71,000—say, a falling off of 27 per cent. Against this shrinkage of some 20,000 loads on the average demand, the total imports arriving in Europe last year amounted to 62,000 loads, or only some 6 per cent. less than the average import of some 66,000 loads during the same period of five years. Europe commences 1904 with landed stocks of some 28,000 loads, and, although the floating supplies are unprecedentedly small and shippers assert that the closing season's outget from the forests will only yield for the new year a very limited supply of first-class European wood, consumers will not be stimulated into large forward contracts but almost certainly repeat their last year's

attitude of only buying from hand to mouth as their needs arise. Shippers have not sufficiently realized that the enhanced cost of teak must check its use in all construction where its special properties are not indispensable, and their action during recent years, whether inevitable or not, has served to strangle its use in certain branches of domestic industries in which it had been for some years growing in favour—quite apart from the ship-building and rolling stock industries, which were its main outlets; and even these outlets have been narrowed by the high prices, which also have helped to bring the Java teak forests into competition with product of our Indian possessions; and although this source of competition is not likely to be of the same scope or seriousness as the Siamese product proved to be, it has undeniably the essential properties of teak and is of a growth which will make it a useful substitute for Burma teak in some classes of work where it has already secured a fair trial—owing to the increased cost of Burma and Siam descriptions.

In respect to London *per se*, the imports into and deliveries from the London Docks during the twelve months ending 31st December, 1903, shew as follows:—

Logs	...	8,795	loads imported, against 7,239 loads delivered into consumption.
Planks and conversions	5,213	"	" 3,977 "
Total	14,007	"	" 11,216 "

NOTE.—The above figures deal only with *landed* stocks, and are exclusive of the overside deliveries, which although very important in quantity, are not noted by the Dock companies.

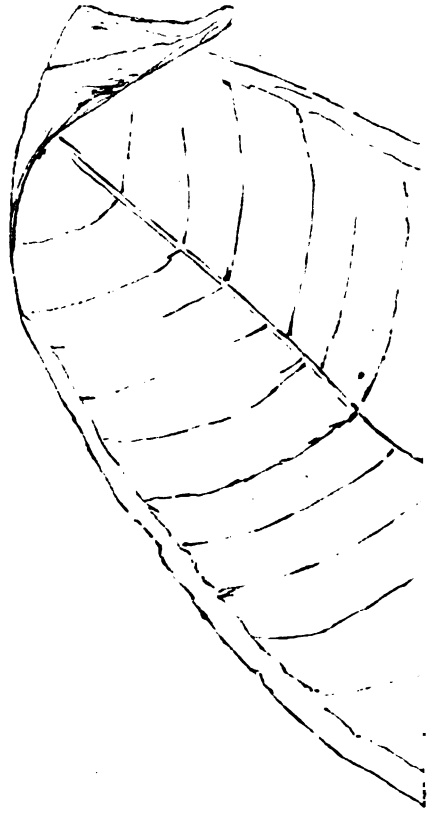
The dock stocks at date analyse as follows:—

6,952 loads of logs, as against 5,394 loads at the same date last year.	
3,914 " planks,	2,706 "
— " blocks,	— "
Total	10,866 loads
	8,101 loads

The timber trade, in common with most other trades, has felt the year just closed to be one of real strain and anxiety. With a few exceptions, such as teak, mahogany and Quebec goods, the imports have been more than ample to fill the dull demand, and want of confidence in the prospects of trade has effectually killed all the briskness and ready marketing of well-bought goods, which go to make "good business." F.o.b. prices have been resolutely maintained by both shippers of hard and soft woods; but the choice of keeping out of the market, or submitting to a cost which has left little or no room for a working profit, has borne hardly on the merchant and dealer who may have no reserve of profit to fall back upon. There have not been wanting signs that the profits of the five good trade years which ended in 1900 have been exhausted, and the restriction of banking facilities must painfully accentuate to many the feeling of business stress and political apprehension with which the new year opens for the majority of thoughtful traders.







# THE INDIAN FORESTER.

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[No. 4.

## Notice to Subscribers.

WE are glad to be able to inform subscribers and contributors that at the close of the year 1903, the *Indian Forester* was once more in a very sound position financially. On 31st December there were 484 subscribers and a free list of 53, giving a total issue of 537 copies. 575 copies are printed of each number in order to allow for the usual demand which exists for back numbers.

The cash balance on 31st December was roughly Rs.5,300, and the receipts during the past year exceeded expenditure by over Rs.1,000.

It is now proposed to form a reserve fund with part of the cash balance, and in future to expend the whole of the annual receipts in publishing the magazine. The quality of the plates accompanying articles will be improved, and when so desired, articles of special interest will be paid for at rates not exceeding Rs.5 per page.

We will be glad to consider suggestions for the improvement of the *Indian Forester* in other ways, and desire to remind contributors that the success of the magazine depends not on the management, but on the contributors themselves.

## **Eugenia Rama Varma - a new Species communicated**

**by J. F. Bourdillon, F. L. S.**

**MYRTACEÆ.**

*Eugenia Rama Varma*, sp. nov.

*Leaves* 4—7 in. by 2—4 in., opposite, simple, entire, base cordate gradually narrowing into a long acumen. Secondary nerves 15—20 pairs, connected by a strong intra-marginal nerve, all well marked. *Petiole* stout, very short, not exceeding  $\frac{1}{4}$  in. *Flowers* white,  $1\frac{1}{2}$  in. across, borne singly or in few-flowered racemes on the old wood on  $\frac{3}{4}$  in. pedicels. *Calyx-tube* white,  $\frac{1}{2}$  in. broad and long, lobes 4, semi-circular, petals 4, white,  $\frac{1}{2}$  in. long. Stamens very numerous, white,  $\frac{3}{4}$  in. long on a thickened staminal disk. Style short and stout. Ovary 2-celled with many ovules. *Fruit* greenish-pink, globose,  $1\frac{1}{2}$  in. diameter, containing one or two large seeds.

A handsome tree of medium size found in the evergreen forests of Travancore and Tinnevely above 4,000 feet; flowers in March, fruit ripens in June.

This is a rare and local tree, and little is known about it. The timber is hard and strong, but it has not been specially examined. It is named after H. H. the Maharaja of Travancore. [See Brandis' *Indian Trees*, p. 318.]

### **Effect of Frost on Tree Sap.**

BY E. RADCLIFFE, KASHMIR.

#### **FOREST DEPARTMENT.**

To a Forest Officer who does not know the reason why, the fact that the moisture absorbed by plants and trees does not freeze during periods of low temperature, when ponds and streams are frozen hard, must be a matter for astonishment. The following information will, to a certain extent, explain the reason:—

Water, as is well known, expands as it solidifies and the mechanical theory of heat points to the fact that if the liquid is subjected to external pressure its freezing point will be lowered.

Sir. W. Thompson, by a pressure of 9.1 atmospheres, succeeded in obtaining water 106° F. colder than ice, and with a pressure of 17.8 atmospheres 232° F. colder.

Moussow, by means of an ingenious apparatus, invented by himself, kept water in the liquid state for many degrees below the normal freezing point.

Water, if allowed to remain perfectly still, may become considerably colder than ice and yet not congeal. If, however, it is subjected to the least motion, or if a fragment of ice be brought into contact with it, it at once crystallizes, and the temperature rises to that of ice.

Despretz, by making use of capillary tubes, was able to obtain water 20° C. colder than ice.

It remains to be seen therefore how Nature applies herself in order to obtain the necessary conditions of pressure on, and absence of motion of, water when absorbed by trees and plants from the soil.

The fact that water rises naturally in capillary tubes will help to explain how seedlings, or even small plants, obtain their moisture from the soil, but this will not be sufficient to explain how moisture is conveyed to the summit of a tall tree. It may be surmised that, before a seedling puts forth foliage, the moisture is obtained from the soil by capillary attraction. The action of transpiration by leaves or needles, when they appear, has the effect, more or less, of a syphon, and the flow of moisture through the cells is obtained without interruption. As a

general rule, the larger the crown foliage area of a tree the greater and quicker will be the girth growth of the bole. By the act of transpiration, therefore, a steady flow of moisture is obtained through the cells in the growing portions of a tree.

The question of pressure has now therefore to be explained. Atmospheric pressure accounts for the rise of the moisture in the cells of the young plants in the same way that water rises in capillary tubes. This is the basis; but external heat, by its mechanical process, increases that pressure; hence on a hot day transpiration, which is a form of evaporation, takes place much more rapidly than it would on a cold day. It is only by the cell formation of the tissues of trees that transpiration is possible. The expansion and contraction of the cells in their growth also supplies increased pressure. This question of pressure therefore supplies one of the necessary reasons on which tree life depends during low temperatures. Trees which grow in cold climates have smaller cells as a rule than those growing in hot climates. The smaller cells would act as very fine capillary tubes, inasmuch that water rises in them more easily than in larger cells.

The question of motion is also of very great importance. As long as transpiration continues, the flow of moisture must move upwards rapidly and unceasingly. Nature's provision for preventing this motion during cold seasons is by causing the leaves to fall. (In the case of evergreen trees respiration is checked probably by the temporary closing of the leaf pores.) By the falling of the leaf, transpiration is checked to a very large extent, and consequently the flow of moisture in the cells. Green branchlets and buds supply sufficient transpiration to keep the moisture in continual though very slow motion. The motion is also a steady flow, confined by pressure in one direction, and this, when largely reduced in speed, prevents the water particles from separating and thus causing friction, and consequently heat, which is the outcome of friction. If it was possible to shake water in a vessel in a sufficiently vigorous manner the liquid would boil. The application of heat mechanically separates the particles of water and places them in a violent unsettled condition.

The absence of motion and the presence of pressure are therefore a necessity for the non-freezing of moisture contained in the tissues of trees and plants.

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### **Notes on Measurements of the girth increment of *Shorea robusta* in Ganjam.**

BY C. E. C. FISCHER, DEPUTY CONSERVATOR OF FORESTS.

SPECIAL interest attaches to sylvicultural notes on *Shorea robusta* in the Ganjam district, as, practically speaking, this is the only forest division of the Madras Presidency in which the species occurs.



As far as I am aware, sal is found in the Presidency, outside Ganjam, only in the Jeypore independent estate and to a very small extent in the agency of the Vizagapatam division.

The former locality is at about the same latitude as the sal tracts of Ganjam, and therefore these latter may be accepted as the southernmost limit reached by sal.

Sal (locally known to the Uriyas as "salwa" or "sodingi") is found in some of the Ganjam agency tracts and in the northernmost taluq of the ordinary tracts—the Gumsur taluq ( $84^{\circ} 20'$  to  $84^{\circ} 52'$  east, and  $19^{\circ} 40'$  to  $20^{\circ} 15'$  north latitude).

In the agency tracts the Forest Act has not been introduced, and these notes apply to the Gumsur forests only.

Two  $\frac{1}{4}$ -acre sample plots were marked out in the Gulleri reserve in 1892 and 1893, respectively, and girth measurements of the sal trees on them have been taken twice or three times a year ever since.

I append a table giving a résumé of the measurements recorded, which explains itself. I will therefore confine myself to a short description of each of the plots.

#### I.—SURADEVI PLOT.

1st measurement on 27th July, 1892.

Elevation about 420 feet.

On the lower gentle slopes descending from the Suradevi hill towards the valley now forming the Russellkonda reservoir.

The steep slope of the hill begins 100 yards west. Soil friable loam, very deep and admirably adapted for sal, being sufficiently but not over drained.

Owing to the area having been burnt over every year up to 1901, there is practically no undergrowth.

Last measurement on 14th October 1903.

#### II.—MOJJAGODO PLOT.

1st measurement in January 1893.

Elevation about 400 feet.

On a very gentle slope descending towards the west to the Loharakhandi stream. Nearest hill  $\frac{1}{2}$  mile north-east, towards which the forest improves a little.

Soil a somewhat sandier and poorer loam than that of Plot I and not so deep.

Nodular limestone probably not very far below surface.

Well drained.

Though not under fire protection prior to 1901, this area seems to have escaped burning more frequently than Plot I. and consequently the undergrowth is in a better condition, though far from satisfactory, containing as it does a large proportion of "weeds" (*Phoenix acaulis*, *Desmodium pulchellum* and *latifolium* etc.) and small climbers (*Phaseolus mungo*, *Atylosia scarabeoides*).

Last measurement on 18th October, 1903.

Plot.		Date of initial measurement.	Period elapsed—years.	No. of trees at initial measurement.	No. of trees now remaining.	AVERAGE ANNUAL GIRTH INCREMENT IN INCHES.										Largest individual average increment, in. hes.	Smallest individual average increment, inches.
						No. of trees.	Inches.	No. of trees.	Inches.	No. of trees.	Inches.	No. of trees.	Inches.	No. of trees.	Inches.		
I—Suradevi	...	27-7-92	11½	51	42	10	526	41	388	2	706	...	...	1m	1n.	13	
II—Mojagodo	...	January 1903	10½	57	54	10	23	44	28	4	625	1	62	288	70	01	

*N. B.*—The trees in the various size classes total up to more than the full number of trees for the whole plot; this is due to the appearance in two classes of such trees as during the interval have passed from one class to the one above; their averages are of course shown in each case only for the actual period they remained in the particular class.

With regard to the tree which has only put on an average annual increment of '01", I find the entry, dated October 1899, against it: "Suppressed all round." The girth recorded in 1893 was 14½," and in 1903 15½," but in October 1899 its girth is shown as 15½". This seeming discrepancy is no doubt due to the drying and peeling off of the outer bark. I find similar anomalies in many cases, though none quite so pronounced. I expected to find that these differences would occur at regular seasons of the year, but the figures do not support this presumption, the sudden decrease in girth occurring at various times of the year.

### **Mycorrhiza: Translated from the *Revue des Eaux et Forêts*, by H.**

PROFESSOR HENRI has, in the November number of the *Revue des Eaux et Forêts*, written a useful note giving a résumé of the investigations to date on the *Mycorrhiza*—literally root-fungus—and the point to which scientists have got in dealing with this question. His article is roughly translated below:—

The very interesting, but as yet imperfectly clear question of the role of the *Mycorrhiza* in the nutrition of forest trees has been latterly the subject of a certain number of researches, and we propose to here analyse the most important of these.

The botanist, Frank of Berlin, described in 1885, under the name of *Mycorrhiza*, an association between the roots of very many forest trees and mycelian filaments, an association so intimate and regular that the root with its mycelium constitutes a morphological whole as clearly characterised as a normal organ.

The study of the associated parts and of the conditions under which this union occurs led Frank to see in it a fact of symbiosis. The mycelian filaments of the *Mycorrhiza*, that one finds so commonly in the Cupuliferæ and the genus *Abies*, would absorb nitrogen in the form of ammoniac or starch as well as mineral salts to supply them to trees.

The greater number of botanists, after having verified the accuracy of the descriptions given by the German professor, adopted his view with enthusiasm. There were, however, some detractors, of whom the chief was the eminent forest botanist R. Hartig. The latter stated in 1888 that these mycelian filaments were simply parasites, of which so many are found upon the various organs of plants and to which they cause no great harm. The hypothesis of Dr. Frank upset, said Professor Hartig, all hitherto admitted opinions relating to the nutrition of trees, and nothing obliged us to accept for the Cupuliferæ, the Abietinæ and the Vaccinæ, a form of nutrition so special and so entirely different to that of the other ligneous species. He considered that these fungi were only parasites, living on roots without killing the tree, just as innumerable parasites were to be seen upon leaves with practically no influence upon the plant. Though, he said, his opinion was quite commonplace, it was better justified by facts than that of Dr. Frank. However, a little later (1891) Hartig came round to the opinion of Dr. Frank and wrote:—"The complexity known under the name of *Mycorrhiza* is a symbiotic association, that is such that root and fungus are associated in a common life and appear as a new being with characteristics of its own." But he adds a little after:—"Frank has expressed the idea that these root fungi have an importance of the first order for the nutrition of trees, by rendering the elements of humus directly utilisable through their means. According to him, not only carbonic but also nitrogenous matter would be directly furnished to the roots by the fungus. Further research would be needful in order to prove this theory, which, so far (1891), was neither sufficiently demonstrated nor refuted. The fact that always, even in humic soils, a great number of the roots is free of fungi and that plants prosper admirably with the *Mycorrhiza*, obliges us to adopt a certain reserve in connection with Dr. Frank's theory. His experiments with young beech and Scot's pine, according to which these plants were worse developed in a sterilised soil than in the same soil when not sterilised, does not prove that the death of the *Mycorrhiza* would be harmful to the young trees, for, by the sterilisation, the soil had undergone other modifications harmful to vegetation."\*

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\* Thus the sterilised soil had lost the bacteria which, since the work of MM. Duclaux, Laurent, etc., we know to be most useful to the germination and the vegetation of young plants.

Judging from the researches made at the Experimental Station of Tharaudt (Saxony) by Messrs. Nobbe and Hiltner, the reserve of Hartig would be perfectly justified. M. Deherain writes (1899):—"They reduce to nothing the hypothesis of Frank (the theory of the *Mycorrhiza*, nurse of trees). For 25 years they have there successfully cultivated in a silicious sand absolutely without organic or nitrogenous matter, silver firs, pines, larch and beech, of which the roots do not show a trace of the *Mycorrhiza*."

We ought to say that we have not obtained the same results at the Forest School of Nancy as at Tharaudt. Pines and Spanish chestnuts have been grown for six years in pure sand without nitrogen or organic matter. If, in May, the time when the new *Mycorrhizas* form and are in full activity, we very carefully take up a young pine or chestnut, we find that all the roots are mixed up with numerous brown mycelian filaments and the presence of the characteristic coral-like root *Mycorrhizas* is shewn.

There is, therefore, as we see, divergence of opinion, not only on the role and the significance of these organs, but even upon their usual presence or otherwise, and it is not the last publication, which it remains for us to consider, which will throw light on the numerous obscure and disputed points of this question.

The recent researches of Dr. A. Müller have dealt with pines of one and two years old, grown either in humus which has been rendered neutral, or in plain (*brut*) humus, or in grey sand, or in yellow mineral sand. In the plain humus the growth has been good, and the almost general presence of endotrophic *Mycorrhiza* was noted, while the ectotrophic *Mycorrhizas* appeared only in the soils without humus or poorly provided with it. In the neutral humus (or forest vegetable mould) the *Mycorrhizas* were entirely absent.

In presence of this fact contrary to what has been up till now admitted, it becomes difficult to deliberately come to a decision in connection with the association of roots and mycelian filaments. For the rest the following is the opinion expressed by the author at the conclusion of his long and minute researches, an opinion with which we personally conform, and which we will cite textually:—"Far from holding as settled the question of the *Mycorrhiza*, I believe that the very remarkable relation, between the fungi and the roots of the higher plants will be, and ought to be, the subject of important and attractive studies. In this matter it is especially necessary to abstain from generalising and from forcing the few little facts which are known to be true into a preconceived mould. It is certain that these researches often provoke, and quite legitimately, the conception of theories and hypotheses which ought to be confirmed or refuted. But for the moment we have, in my opinion, gone far in this direction; we

have even theorised to such an extent that nearly all imaginable hypotheses have found defenders. We can only attain to useful work after isolated and careful researches. If I regard the fact noted hitherto for our forest trees, I can only adhere with the fullest conviction to what Dr. Sarauw has lately written to me, viz., 'To my mind it has not been shown, either by observations made in nature, or by experiments, that the fungus of the *Mycorhiza* is advantageous to the roots of forest trees and to the trees themselves.'

In his turn M. Müller, Director of Forests in Denmark, affirms, in his recent work, that the roots of the mountain pine are densely covered with dichotomous *Mycorhizas* in the soil of the dunes of the shore of Jutland, which is absolutely without humus, but that, in contradiction of M. Müller's results, they are present also in the soils of the "landes" of Jutland, which contain an acid humus. In such soils it has been found that the spruce does not thrive in the areas artificially planted, unless mixed with mountain pine. This it was which led to the *Mycorhizas* of these two species being made a special study. M. Müller found on the roots of the mountain pine ectotrophic *Mycorizas* of two sorts, first those which he calls rootlike (*racemenses*), which imitate the normal structure of the laterally ramified root, and which are the commonest in the case of the Cupuliferæ and Coniferæ, and secondly, others, called dichotomous, which issue from the young terminal root and present at first the form of a small tubercle, which soon becomes dichotomous.

The resemblances which exist between the dichotomous tubercles of the mountain pine and the dichotomous tubercles of the Elders and of the Eleagnaceæ or the simple tubercles of Podocarpus, suggested to the eminent Danish forester the idea that the tubercles of the pine might render to the tree which bears them the same service which is rendered to their trees by the two other groups of tuberculous formations. We know that it has been shown by the work of Messrs. Noble and Hiltner that these latter play an important part in assimilation of the free nitrogen of the atmosphere.

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## II.—CORRESPONDENCE.

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### Our Neglected Commercial Side.

IF Mr. Fischer had communicated with the Reporter of Economic Products to the Government of India, he would have found that in the utilisation of Bhabar grass we are far from being "exactly where we were seventeen years ago." He might have been referred to the Annual Progress Report, Forest Department, of the Lower Provinces of Bengal, for 1895-96, where it is stated that "this commodity is still in great demand for the

manufacture of paper." During that year 358,289 maunds were imported into Calcutta and 200 tons were exported from Calcutta to Glasgow.

I could give more recent references. But this is sufficient to show that there is no question now as to the value of the material.

W. T. THISELTON-DYER.

Kew, 23rd November 1903.

### The 'Kongu' Tree of Tinnevely.

THE measurements of the leaves of *Hopea Wightiana* at page 19, line 19, of the January number of the *Forester* should be:—

Leaves 5—8 in. by 2—3 in. Also, the wings of the fruit should be 2—3 in. long.

J. F. BOUDDILLON.

## Fire Protection in the Teak Forests of Lower Burma.

### I.

I SEND as a rejoinder to Mr. Walker's article under the above heading the following extract from the diary of Mr. A. E. Ross, Deputy Conservator of Forests, Thaungyin Working-plans, dated 15th December 1903. It affords a recent instance of damage done by fire to teak trees growing in rich teak forests. It is noteworthy that the loss observed has occurred in one hot season. Mr. Ross expresses the belief that the forest in question had been annually burnt, but the damage was observed in a sample area which had been examined last year. Mr. Ross writes:—

"The results of fire in the rich teak forest in the bend of the river, immediately above where the Melama road crosses the Thaungyin, and just below this point, are appalling. Last season the counting in a sample area of about 180 acres, gave 24 dead teak trees over 3 feet girth and 26 sound teak trees over 7 feet. This season the counting gave 15 dead trees and 17 green ones of the same girths. Some of those missing are lying on the ground due to fire. As far as could be ascertained none have been removed by any contractor since last season. Up to now in this part of the reserve the forest outside the fire-line, including all the richest portions in the bends of the Thaungyin river, has, I believe, been annually burnt outwards from the fire-line by the fire coolies. If my advice were taken the bends of the river containing rich teak forest would be specially protected."

I may explain that the adoption of the plan which Mr. Ross advises was ordered several months ago. He was himself in charge of the Thaungyin division in the previous season. The cutting off of the bends of the Thaungyin river, in order to shorten the fire trace, has to be done within the reserve, because the other bank of the river is Siamese territory.

Perhaps other officers who know their forests well and can cite similar instances of the damage done by jungle fires in teak forest, will kindly describe what they have seen. It is not necessary to write a very long article. An ounce of fact is worth a ton of theory.

TOUNGGOO.

F. B. MANSON.

## II.

A paper by Mr. H. C. Walker in the December *Forester* on fire protection in Lower Burma, seems to call for some remarks, for while it is not possible to follow much that he says, there are points in it which are worthy of consideration.

Mr. Walker's arguments are somewhat discursive, and it is not always easy to understand what the writer means. but after a careful perusal of it it may be gathered that Mr. Walker is in the position of an agnostic as regards the protection of teak from the effects of fire, and that he thinks more harm may be done to the young teak by encouraging the growth of useless species, which increase the shade and so have a prejudicial effect on it, than could be expected to accrue from any amount of forest fires.

Now it is hard to see how this can be arrived at by exact proof, for silviculture is a science based on observation, and as Bagnieris says at the commencement of his *Manual*, "comme tout ce qui repose sur l'observation, la sylviculture est toujours perfectible." In this spirit we may welcome Mr. Walker's remarks as a step in the direction of true science.

To begin with, it is not possible to take up the question from the same point of view in all places where teak grows. Nothing can be more dissimilar than the conditions of teak vegetation in the forests of Lower Burma and in the Panch Mahals in Bombay. But as Mr. Walker is writing of Lower Burma these observations will be confined to his paper.

Mr. Walker says "It is a general belief that fire is responsible for a great number of hollow trees;" also "old age, suppression, etc., seem to me sufficient to account for the hollow trees we find, and I entirely fail to understand how the burning back of a teak seedling can possibly cause hollowness."

It does not require a long acquaintance with the forests to know that hollow trees are not necessarily by any means always old trees, and that many, nay most full grown teak trees are hollow, sometimes for several feet up the butt. It was in old days in Burma, as well as elsewhere, the usual practice of the natives to build a scaffold round a teak tree and fell it several feet from the ground, because the butt was useless from being hollow. How does he account for this? By suppression? Of what description?

Mr. Walker is no doubt quite right in saying that a teak tree has great powers of resistance against fire. But he seems to overlook the fact that the damage to the growth of the tree is caused by the scorching of the bark, which interferes with the

rising of the sap: and it is to this cause that in the majority of cases the injury is due in the growth of the tree, which Mr. Walker, at the foot of page 559, attributes to suppression by shade. The fire is certain: the shade can only be a supposed cause.

However, all will agree with Mr. Walker when he says that the object of forest conservancy in teak forests should be to increase the production of teak trees, and it certainly would seem useful to institute a series of careful observations, in different localities, to endeavour to ascertain whether in a climate like Lower Burma, where natural vegetation is so luxuriant, protection of the forest from fire may or may not have the effect of encouraging the growth of certain less valuable species to the detriment of the regeneration of teak. With regard to such details as "keeping a few typical areas under observation and noticing the extent to which they suffer from fire: and whether slight wounds develop into large ones, or gradually heal up" etc., Mr. Walker himself might be so good as to carry out experimental observations himself and communicate the result to the *Indian Forester*. Such results, in a practical form, would be interesting to all its readers; indeed a pennyworth of practice is worth many pages of speculative discussion.

AN OLD PROTECTIONIST.

### A Portrait Gallery of Forest Officers:

I SHOULD like to make a collection of signed and dated photographs of as many Indian Forest Officers as possible for an album to be kept in the Library of the Forest School at Dehra. Such a collection would in time become quite historic and full of interest.

May I, through the *Indian Forester*, ask Forest Officers if they will be so good as to let me have their photographs for this purpose. I should be very much obliged to them.

Dehra Dun, 4th February 1904.

A. G. HOBART-HAMPDEN.

### The Spike Disease among Sandal.

MR. P. M. LUSHINGTON, in his "Notes on Sandal" that appeared in the January number of the *Indian Forester*, mentions in para. 5.—Diseases thereof—that spike has found its way into his district and that it has not been introduced by contagion from Mysore. I am glad poor Mysore, which has hitherto been thought the centre and origin of this disease, is in this instance spared from this further disgrace. Mr. Lushington believes that it may not be impossible to trace the origin of spike to fire, and it is more anent this remark of his than anything else that I have penned the following hurried notes before the completion of my special duty on spike.

2. Almost the whole of the western half of the Hunsur Taluk is overrun with thick lantana. Since its invasion into this part



many villages have been deserted, and those not deserted are hard pressed by it. All valuable growth, including sandal, is being ousted. Leopards, pigs and other wild animals have been increasing by hundreds, sparing neither men nor crop. To keep body and soul together the ryot here does not hesitate to regularly set fire to the lantana jungles in hopes of destroying it, in blissful ignorance of the fact that the more the lantana is burnt the more it flourishes.

3. Apart from this outside firing by villagers, fires from the jungle are of yearly if not of periodical occurrence. In such jungles one can hardly find a single big sandal tree. The existing crop consists entirely of seedlings and root-suckers, two to three years old, waiting their turn to be again burnt. With fires from the villages, fires from the jungle and fires all round what can be the fate of a sensitive tree like sandal?

4. In this locality at least there is no spike in areas thus burnt over, and the seedlings and root-suckers look all the better for being burnt. Provisionally speaking, if fires are not the real cause of spike, the question naturally arises,—how then are they connected with it?

5. All effort to find a single diseased sandal entirely dissociated from lantana have proved futile. In *hoblies* of this taluk where there is no lantana and few fires, sandal is quite healthy. The powers of lantana as a combustible are great, and hence its requirements of C.O., greater at least than that of sandal. What is the result? During the fires, lantana and other congeners of sandal and sandal itself probably concentrate from the atmosphere overcharged with gaseous products of combustion, more C.O. gas than is perhaps required for the healthy state of sandal. Might it not be that this circumstance, among others, causes the intensified carbon assimilation and leaf hypertrophy so characteristic of spike.

6. On the strength of this theory might be reconciled the fact that when first observed the disease was confined to fairly large sized trees and those on higher altitudes. It was believed, erroneously though, that the small seedlings were quite immune from spike. It looks as if the tall trees and those of higher altitudes got affected first through atmospherical agency, and then the smaller ones were spiked by contagion spreading centrifugally underground or otherwise. To quote Dr. Butler, "It is as if a first wave of the disease passed rapidly through the air, and that those trees which escaped this first attack were afterwards slowly killed out by underground spreading, a mode of extension which is always gradual."

7. In affected areas, sandal is not the only tree spiked. It was only the other day that Mr. McCarthy drew my attention to spike in *Zisypheus*, which he characterised as the forerunner of spike in sandal. I hope many more species with spike may be brought to light in such areas.

8. The disease is conspicuously absent from date groves and *kavals*, which, though overrun with lantana, are better protected from fire in Mysore. In only a solitary instance the fringes of a *kaval* showed half a dozen cases of spike. Just round village huts

and along sandal-avenued cart tracks, called locally *onis*, spike is common. It is just in both these localities that large quantities of cow-dung, leaves and other manure are always allowed to decompose in pits. Putting these facts together, I think the percentage of C.O. in the atmosphere of such places must be sufficiently high to induce spike among sandal.

9. For the information of the specialists who were pleased to come to Hunsur during the late Dassera holidays, I submit that the operations instituted by them in *re* the budding of spiked buds on healthy sandal have not yet shown any signs of success. I shall be glad to give through this any further information if required on the operations referred to above.

10. Some Foresters favoring spike uprootals appear disappointed with the reappearance of the disease in areas where uprootals were once made and have come to doubt the efficacy of such operations. I believe there cannot be a greater mistake. Considering the long distances lateral roots of sandal travel in search of food materials, I doubt if the uprootals made have been perfect. In any case, unless the affected areas are thoroughly fire-protected and unless all spiked sandal are then and there uprooted on the lines suggested by Dr. Butler, there seems no hope in the near future at least, for the eradication of the disease.

CAMP NLLAWADI.

PURUSHOTTAM V. SONKROY,  
*Ranger, Special Duty.*

### **The Review of Forest Administration in British India. 1901-1902.**

It is undoubtedly a fact that, in certain cases, working-plans have been prepared unnecessarily in the Central Provinces. In your January number, page 25, you comment, in the following terms, on the error of judgment that has occurred in this matter. "No greater mistake was ever made than the comparison by local Governments of their own progress in the preparation of working-plans with that of other provinces, and the debt they owe to the Government of India for this timely warning is not a light one."

It may be that the Government of the Central Provinces has compared its progress in the preparation of working-plans with that of other provinces; I have not been able to find that it did so. In any case, it is certain that the Government of India itself once made such a comparison; and further, that it has continually urged the local Administration of these provinces to hasten on the preparation of working-plans. The following extracts from all the Government of India Resolutions on the Central Provinces Forest Reports of recent years, to which I now have access, clearly show this :—

1886. His Excellency in Council is confident that as soon as it becomes possible to provide special officers for the charge of working-plans, this important branch of work be energetically prosecuted; but I am at the same time to invite your attention to the remarks made on this subject in the review of last year's report, regarding the progress which it has been found possible to make in other provinces by means of the ordinary staff."

1887. "It is a matter for regret that it has not yet been found possible to strengthen the Forest staff of the Central Provinces sufficiently to provide for the formation of a working-plan Division."

1888. "If any progress (in the preparation of working-plans) is to be made commensurate with the whole area to be covered, it may be found necessary to employ Divisional Officers on the preparation of simple working-plans for the less important forests."

1889. "As has been already pointed out by the Government of India . . . . . it is only by utilising the Divisional staff that, in view of the immense area for which plans are required, any material progress can be looked for."

1890. "The advance made in the compilation of working-plans has up to the present time been disappointing."

1891. "At the same time there seems to have been no sufficient reason why, even in the absence of the new maps, simple projects for systematic working of the more important forest areas should not have been framed."

1892. "The majority of working-plans in the Central Provinces will thus be so simple in their nature that rapid progress may be expected as soon as reliable maps are ready."

1893. "Your remarks on what has so far been achieved on the work remaining to be done (in connection with working-plans) satisfy His Excellency in Council that the requirements of the situation are fully grasped and that the work will not be allowed to drag."

1896. "It is noticed that an area of 2,500 sq. miles is entered as not requiring working-plans. This is doubtless correct, but the statement might well be supported by an explanatory para. in next year's report."

1898. "The progress made in the preparation of working-plans is noticed with peculiar satisfaction."

It follows that, in order to praise the Government of India while blaming the local authorities of the Central Provinces, you have made implications which are not wholly justifiable, a fact which is the more to be regretted when one considers the unpleasantly didactic nature of the criticism.

C. P. FISCHER,

CAMP NAGPUR.

*Offg. Conservator of Forests.*

## III.—OFFICIAL PAPERS AND INTELLIGENCE.

**Mr. R. S. F. Fagan.**

WE have heard with much regret of the sudden death of Mr. R. S. F. Fagan on 21st December at Hove, Brighton. Mr. Fagan went home early in November suffering from an affection of the liver, intending after a change of climate and rest from work to return to Bombay and complete the few years which were left of his term of service.

Mr. Fagan received his forest education at Nancy, and along with Mr. Aplin came out to India in 1877.

He was posted to the Bombay Presidency and served there continuously throughout the various grades until he became Conservator, a post he was occupying at the time of his death.

A keen sportsman, an excellent shot and a thoroughly sound man at his work, by his death the Bombay Presidency and all who knew him have suffered a heavy loss.

**Reproduction by Sucker Shoots.**

THE term *root-sucker* has become an expression of ordinary parlance, but it is possible that some botanists would laugh at the term, for a root is supposed to differ from a stem and its branches by (*inter alia*) the former never producing leaf-buds. *Root-suckers* are the young shoots that spring up from intervals of what are ordinarily called lateral roots, but more strictly speaking perhaps should be underground branches; at these intervals the buds send up vertical stemlets and downwards root-lets; perhaps a better expression for these growths would be *sucker shoots*, which would contrast this mode of reproduction with that of coppice shoots.

It is rather surprising how little attention is paid to reproduction by sucker shoots; it does not appear to have met with as much recognition as it would seem to deserve.

In looking through Gamble's revised *Manual of Timbers* for instance, whereas in so many instances the various species are said to "reproduce well from seed and from coppice," and even "from cuttings and slips," I think there are only ten species, *Ougeinia dulbergioides*, *Dalbergia sissoo*, *Pterocarpus santalinus*, *Acacia dealbata*, *Diospyrus melanoxylon* (including *Tomentosa*), *Millingtonia hortensis*, *Stereospermum chelonoides*, *Anicennia officinalis*, *Artocarpus hirsuta*, *Populus euphratica*, which are definitely stated to reproduce from sucker-shoots, and two others

*Heritiera minor*, *Rhizophora mucronata*, in which this mode of reproduction is distinctly hinted at but not definitely stated.

Again, Sir D. Brandis, in his *Forest Flora*, mentions only the following nine species:—*Ailanthus glandulosa*, *Balanites roxburghii*, *Zizyphus nummularia*, *Prosopis spicigera*, *Cornus sanguinea*, *Diospyrus melanoxylon* (including *Tomentosa* and *Tupru*), *Hippophæ sulcifolia*, *Alnus incana*, and *Populus tremula*.

In my peregrinations of the last few years, my attention has been drawn to the fact that a very large number of woody plants produce sucker-shoots, and the following may be mentioned: *Polyalthia cerasoides*, *Anona squamosa*, *Kydia calycina*, *Helicteres isora*, *Eriolaena quinquelocularis*, *Grewia orbiculata*, *Ægle marmelos*, *Balanites Roxburghii*, *Boswellia serrata*, *Balsamodendron* (*Protium*) *candatum*, *Melia indica*, *Soyimida febrifuga*, *Chloroxylon swietenia*, *Celastrus emarginata*, *Elaeodendron Roxburghii*, *Schleichera trijuga*, *Dodonæa viscosa*, *Buchanania latifolia*, *Odina wodier*, *Ougeinia dalbergioides*, *Dalbergia latifolia*, *Dalbergia sissoo*, *Dalbergia paniculata*, *Pongamia glabra*, *Pterocarpus marsupium*, *Cassia fistula*, *Cassia auriculata*, *Cassia montana*, *Cassia Siamea*, *Tamarindus indica*, *Xylia dolabriformis*, *Acacia eburnea*, *Acacia leucophloea*, *Acacia arabica*, *Acacia catechu*, *Albizia procera*, *Albizia amara*, *Albizia odoratissima*, *Pithecolobium dulce*, *Terminalia tomentosa*, *Anogeissus latifolia*, *Alangium Lamarckii*, *Randia dumetorum*, *Izora parviflora*, *Morinda tinctoria*, *Lumnitzera racemosa*, *Aëgiceras majus*, *Diospyros melanoxylon* (including *Tomentosa*), *Diospyros chloroxylon*, *Schrebera swietenoides*, *Wrightia tinctoria*, *Millingtonia hortensis*, *Dolichandrone falcata* and *crispa*, *Tecoma stans*, *Heterophragma adenophyllum*, *Lantana camara*, *Tecoma grandis*, *Vitex negundo*, *Vitex altissima*, *Anicennia officinalis*, *Santalum album*, *Bridelia relusa*, *Flueggia leucopyrus*, *Mallotus philippinensis*, *Antideuma ghaesembilla*, *Excoecaria Agallocha*.

It may perhaps be interesting to locate where some of these were found producing sucker-shoots.

In the *Indian Forester* some years ago there was an article about the black wood (*Dalbergia latifolia*) and its reproduction from sucker-shoots; but in the fellings recently conducted in the Nallamalais of Kurnool there are prolific sucker-shoots both of this species and of *Dalbergia paniculata* whilst in the Chirala plantation of Bopatla taluq, in the Kistna district, there are several sucker-shoots between each pair of plants of *Dalbergia sissoo* planted six years ago. When I was in Cochin nearly four years ago the Conservator, Mr. Alwar Chetty, pointed out to me how very prolifically the iron wood (*Xylia dolabriformis*) was springing up from sucker-shoots, especially in areas which had been burnt over by fires and where the roots were at all exposed.

In Coimbatore district on the Dimbham (16-17 mile) and Bellajighauts, *Ougeinia dalbergioides* shows fine example of the same method of reproduction, whilst sandal in that district has latterly been propagated chiefly by that means, the example having been set by Mr. P. M. Lushington, who first instituted the method of exposing the upper surface of those roots that were too small to be dug up for sale. The same takes place also at Sandur forests in Bellary.

When pulling up what appeared to be seedlings of babul (*Acacia arabica*) in the Kistna district, they were found not to be seedlings at all, but sucker-shoots; and this operation was done similarly for the white babul *Acacia leucophloea*, *Cassia fistula*, and *Cassia auriculata*. The babuls (including *Acacia eburnea*), *Prosopis spicigera*, and *Melia indicu*, were found to be similarly reproducing themselves in the Khojjapalli Reserve in Anantapur district, and in many other places in that and the Kurnool district.

By far the greater part of these species were noticed in this way, however, on the road from Kallipatti to Ramandrug in the Bellary district, where the cutting on the side of the road offers excellent facilities for seeing the root system. In that locality it was found that *Hardwickia binata*, satinwood (*Chloroxylon swietenia*), ebony (*Diospyros melanoxylon*), *Anogeissus latifolia*, Cutch (*Acacia catechu*), *Schleichera trijuga*, and *lantana*, all produced a most abundant crop of sucker-shoots, whilst teak (*Tectona grandis*) and *Terminalia tomentosa* produced very few, kino (*Pteracarpus marsupium*) hardly any, and lesser ventea (*Lagerstramia parviflora*) none at all.

In the mangrove swamps near Nizampatam in Kistna district, *Lumnitzera*, *Anicennia*, *Excoecaria*, and *Excoecaria* were all seen to produce them; but there was also a copious growth from seed, which (as did also to an enormous extent that of *Deris uliginosa*) collected in long series of lines along the level of the high tide.

Finally, Mr. Cowley-Brown, Working Plans Officer, informs me that in pulling up what he believed to be sal seedlings (*Shorea robusta*) he has found them also to belong to the root system of a larger plant of the same species.

In the case of black and white babuls (*Acacia arabica* and *leucophloea*), of Cutch (*Acacia catechu*, variety *Sundra*), of *Prosopis spicigera* and a few others, the mode in which these sucker-shoots developed was sometimes most remarkable and characteristic: they came out usually in radiating lines around the stump of the tree (especially of trees that had been felled), and very often those nearest the tree were largest, gradually getting smaller and smaller along the line as they were further away from the stump.

There almost always (but not always apparently) seems to be a better chance of suckers springing up when a portion of the

upper surface of the lateral root (or underground branch) is exposed in places; and as mentioned above, they seem to come up more prolifically from trees which have been felled; the former development, I presume, is due to the tendency to form buds under the action of light (or perhaps rather due to the tendency of such buds to lie dormant when not exposed to light); the latter development to the tendency of the sap to go to other parts of the tree when it is impossible for it to rise up the trunk owing to its having been felled.

I have always heard it said that babul (*Acacia arabica*) regenerated itself most prolifically from self-sown seed; that it does so, I do not deny; but I have found that a very fair percentage of what I always supposed to be seedlings (and have found several other officers have made the same mistake) have been these sucker-shoots: and I have wondered since then whether by any chance other gregarious species do not, after a heavy thinning, likewise produce a large percentage of what are ordinarily supposed to be seedlings but really sucker-shoots.

It has seemed to me too that in some of the terribly mutilated forest growths and scrubs that we come across, a very large proportion of the growth is from these sucker-shoots; possibly also hacked down to form an apology for a coppice, but practically reproducing itself to a large extent from sucker-shoots; and in the case of hills where vegetation has been cleared out almost altogether, would it not be advantageous to try and make use of this growth, finding out the root system of trees that still grow, and expose their roots (i. e., underground branches) in the endeavour to make them produce sucker-shoots some distance away from the parent tree?

In the Adoni taluk of the Bellary district the ryots have adopted a method of planting, which is both curious and at the same time most successful. They raise small bunds about 1 to 2 feet high, and dibble in seeds chiefly nim, (*Melia indica*) just before the rains on the tops of these bunds. They pay no further attention to them, neither water nor culture them; and yet the results in most cases have been excellent.

It might be advantageous therefore in some of the almost bare hillsides, such as are so frequent in the Ceded Districts, to combine these two principles, extract the earth from the underground branches of existing trees, so as to produce sucker-shoots, and with that earth raise bunds in which to dibble seeds of plants likely to grow in the vicinity. If by means of these bunds the young trees could be induced to spread their roots into the crevices of rocks, it might be possible to clothe areas which at present look well-nigh hopeless.

As regards the differences between this method of reproduction and coppice, it might be suggested that coppice forms on an old stump and on an old root, both of which are liable to rot away; whereas from suckers, the exposed surface of the under-

ground branch need not be damaged in such a way that at the point of reproduction water would have a tendency to lodge and thereby rot the parent stock and it would form a root of its own at the same time as it forms a stem of its own. Again, whereas in coppice the new shoot comes up on the site of the parent stem, with sucker-shoots they would come up at various distances away from the parent stem, and tend to cover the ground in a shorter space of time.

For these reasons, therefore, it seems to me that a system of reproduction by sucker-shoots deserves closer attention than has hitherto been paid to it.

A. W. LUSHINGTON.

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#### IV.—REVIEWS.

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##### **Forest Administration in the Punjab during 1902-03.**

THE area under the Forest Department underwent considerable change during the year, although the variations had no considerable effect on the total area at the close of the year. Large areas were given up for colonization and cultivation, while an area of 131,274 acres of jagir forest in Kangra was brought on to the books of the department. Further areas are likely to be given up for cultivation as the different colonization schemes progress, meanwhile the total area under the charge of the department at the close of the year was 6,142,1.6 acres. The area is by no means a large one when compared with areas in some other provinces, but is amply sufficient for the staff available for its control.

Settlement, demarcation and surveys are all well advanced, with the result that it has been possible to give much attention to the management and working of the forests. Sanctioned working-plans are in force for .79 square miles of reserved forests and 1,829 square miles of protected forests, and during the year progress was made in preparing working-plans for 151 square miles and 740 square miles of reserved and protected forests respectively. There is thus left a balance of 2,294 square miles of reserved forest and 4,921 square miles of protected forest for which working-plans have still to be drawn up.

A sum of Rs. 25,309 was expended on communications and buildings, the expenditure under this important head amounting to 16 per cent. of the 12 per cent. of the gross revenue which was expended on protection and improvement. We would like to see a still further advance in this direction, and think that for many years to come it would be a sound policy to devote not less than 25 per cent. of the expenditure on protection and improvement to roads and communications.

203 fires occurred which passed over 17,938 acres of forest. Of this 12,410 acres were specially protected, and the area burnt



was over 2 per cent. of the area over which special protection extended. It should be remembered that the department endeavours to protect from fire all the areas under its management, and the area burnt forms only 0.3 per cent. of the total area under the department. Most of the damage done was due to incendiarism, no less than 80 such cases having been discovered and having affected 13,753 acres.

With regard to natural reproduction, we read that;—“the natural reproduction of deodar, the most important species in the Punjab, varies very greatly. In favourable situations, where there is a fair rainfall and not too much cover overhead, or too dense undergrowth on the ground, the reproduction is all that can be desired and has been in many places observed coming up like a crop of corn. Large areas in all our deodar-bearing tracts are thus covered with young growth of great prospective value. On the other hand, in very damp or very dry situations, in deciduous forests with scattered deodar and heavy undergrowth, reproduction is bad or wholly absent. Regeneration fellings of recent years have too often been followed by heavy undergrowth and no reproduction of deodar. It is hoped that with time deodar will establish itself, and in any case reproduction in favourable situations, and particularly under the light cover of mature blue-pine and sometimes of the *chir* pine (as in Kuln), is so excellent that the future of the species is well assured. It was a bad seed year and poor crops are reported from all Divisions.

The reproduction of other valuable species, especially in the hills, was all that could be desired where the locality was suitable. Thinnings are said to be required in all the young deodar, blue pine and *chir* forests, which now cover extensive areas in the Punjab Hill Forests. More particularly it is important to thin out dense crops of young deodar, which left alone will not by any means yield the best results of which the soil is capable. The difficulty of disposing of the produce, the danger of littering the forests with dry wood, and the inadequate number of trained officers are causes which have hitherto prevented thinnings being carried out to the extent known to be advisable.

In this connection we find that an important step has been taken by the issue of orders to select sample plots in all hill divisions of even-aged young deodar, blue pine, or *chir* forest. It is intended to carry out thinnings of different degrees of intensity in these areas, and to keep up a careful record of the effects on the growth and yield of the various crops. These experiments will in process of time add much to our knowledge as to the degree of density in which crops of these species can be expected to yield the most favourable results, and as to what is the true exploitable age of such crops.

Apart from certain minor unregulated fellings, largely by right-holders, the hill forests were worked by selection and

improvement fellings. About 10,700 trees, mostly deodar, were removed by selection, and large areas were gone over under improvement fellings. There were no clear fellings, and coppice fellings were executed largely in the reserved forests of the plains and over a large area of poorly stocked *rakhs* in Montgomery for the supply of fuel to the railway. The average yield per acre in the Changa Manga plantation was 3,395 c ft stacked, which corresponds to a yield of 204 cubic feet stacked per annum per acre.

Export was mainly by river, and the report contains some valuable and interesting notes on the loss of timber in transit, which we quote at length:—

“The loss in transit from the Pangli forests during eleven years of 162,030 c. ft. of deodar logs and 76,254 c. ft. of deodar scantlings, as compared with 157,052 c. ft. and 94,035 c. ft., respectively, for the first ten years, shows a recovery of 17,781 c. ft. of deodar scantlings assumed to be lost. The loss in logs has therefore been 28 per cent., of which 15 per cent. may be attributed to shrinkage and 13 per cent. to loss in transit. The loss in scantlings has amounted to 32 per cent. This enormous loss on the Chenab river is being investigated. Similar heavy losses have occurred in the timber launched from the Kaghan forests and received at Jhelum. The timber on both these rivers passes for a long distance through Kashmir territory, and if improved protection cannot be afforded by the Kashmir authorities, it will be necessary for the British Government to take steps to protect its interests. Loss in transit should not exceed 5 per cent. at the outside.

From the Bushahr forests the loss in transit in twenty-one years has been 908,511 c. ft. of deodar logs and 198,568 c. ft. of deodar scantlings. On the Sutlej river therefore the deficit of timber exported in the log has been 22 per cent., 16 per cent. of which is attributed to shrinkage, etc., the rest to loss in transit. A considerable amount of timber is, however, known to be stranded in the river, and the real loss is probably not so great as this. Of the scantlings launched 18 per cent. have not been received in depôts.

The measurements of logs at the launching points and of the same logs when received at the sale depôts were continued, and there are now five years' figures to help us in estimating the amount of loss incurred by a log in its transit from the forests to the sale depôts. These observations have been taken on the Jhelum, Ravi, Chenab, and Sutlej rivers, and show that a loss of at least 16 per cent undoubtedly occurs. The logs, it is to be remembered, often take two or three, or sometimes many years to reach the depôts, during which time they are frequently stranded and exposed to the sun. They have also to pass through many rough places, and the loss is probably as much due to wear and tear in the water as it is to actual shrinkage of the timber. Further observations are required to set this point at rest.

A statement was made in paragraph 41 of last year's report that enquiries made in Bashahr tended to show that "for every 100 c. ft. cut in the forest and exported in the log not more than 72 c. ft. are received in depôts, some 19 per cent. of the loss being attributed to shrinkage, whilst for every 100 c. ft. cut and exported in scantling it is calculated that 48·5 c. ft. reach the sale depôts." This statement has attracted considerable attention, and not being as clearly expressed as it should have been, requires further explanation.

By measurements made during the last five years it has been found that for every 100 c. ft. of log measured where it has been felled in the forest, 91. c. ft. reach the launching point, 9 c. ft. being lost on the way from the forest to the river. This is chiefly due to the loss of the bark, which gets knocked off in transit. Of the 91. c. ft. launched in the log there will be a loss of about 16 per cent. or 14·5 c. ft. on account of shrinkage and general wear and tear in the water; and 5 or 6 per cent. on account of breakages and thefts in transit. Not more therefore than 72 c. ft. in every 100 c. ft. cut in the forest and brought out in the log reach the sale depôts.

For every 100 c. ft. of timber cut and sawn up, not more than 52 c. ft. of scantlings will be obtained, i.e., there is a loss in conversion of 48 per cent. Of these 52 c. ft. 5 per cent. may be lost in transit, so that not more than 49 c. ft. of scantling out of every 100 c. ft. cut in the round can be expected to reach the sale depôts. No deduction is made for shrinkage in the case of scantlings, which do not contain sapwood as is the case with logs; these are moreover usually cut slightly larger than the standard sizes to allow for shrinkage and wear and tear, and the loss on this account is included in the loss by conversion."

3,066,703 c. ft. of timber and 39,332,253 c. ft. of fuel were removed during the year, of which 998,312 c. ft. timber, valued at Rs. 45,317, and 33,411,589 c. ft. fuel, valued at Rs. 3,95,645, were removed by right-holders and free grantees. In spite of these very large free removals the work of the department during the year resulted in a surplus of Rs. 4,50,678 as compared with Rs. 5,32,692 in 1901-02, the decrease being accounted for by an extraordinary payment during the year under report of Rs. 1,61,583 on account of the share of profits of the Chamba State for the three preceding years.

### **Annual Report on Forest Administration in Burma for the year 1902-03.**

THIS report is an interesting, if not an altogether satisfactory one.

The usual annual addition of about one thousand square miles (983) was made to the area of reserved forests, which now covers 19,708 square miles.

Over 2,000 square miles also were under settlement, or awaiting settlement, during the year.

In the case of certain fuel and fodder reserves, it was found that claims to rights of grazing and forest produce were made and admitted by the Settlement Officer to an extent which would lead eventually to the denudation of the reserved area. Since these reserves will be needed, as the fuel supply from waste areas steadily diminishes with the spread of cultivation, the Government has had to restrict the rights admitted by the Settlement Officer.

A total length of 772 miles was newly demarcated during the year, and 939 miles of boundary are awaiting demarcation. Six working plan parties were at work throughout the year, and operated over an area of 921 square miles.

Up to date working plans have been made and sanctioned for only 12½ per cent. of the total area of reserved forests in the Province, a fact which speaks strikingly of the urgent necessity of an increase of officers in this Province.

Under the head of forest offences, 2,264 breaches of the law were reported during the year, and the most serious increase was from 59 of the previous year to 128 in the number of cases of injury to forests by fire. One aspect of the difficulty of fire protection in Burma is shown by two instances quoted in the report, in one of which three men who admitted having lit a fire in a reserve, were sentenced to be confined during the sitting of the court (two hours); and in the other, three men who were caught red-handed lighting a fire in a reserve were tried by a *third class* magistrate, and fined one rupee each. The most noticeable part of the report is that devoted to the burning question of fire-protection.

The results for the year may fairly be described as disastrous.

The total area which it was attempted to protect was 4,744,652 acres, of which about one quarter was burnt. There was a large increase in all four circles in the area attempted to be protected, and the total cost amounted to Rs.2,15,144, while compared with the previous year only 455,821 acres have been added to the area actually protected, and that at an increase of expenditure of Rs. 47,124, or about 10 acres to the rupee! The following note on fire-protection by Mr. Slade is quoted in the report:—

“ I view with absolute alarm the present craze for increased fire protection at the cost of other and, in my estimation, equally if not more important work. Up till recently it was considered almost an act of *lèse majesté* to suggest that fire-protection was not all that had been claimed for it, but in the future it is to be hoped that officers will be encouraged to freely express their views. No trained forester can fail to recognize the benefit of fire-protection in certain directions, but it has its limitations. Let it be granted that fire-protection increases the fertility of the soil, conduces to sounder timber and does away with one great

cause of destruction of fallen timber; of what avail is it if, at the same time, it causes a cessation of natural reproduction, exposes teak forests to the danger of being eaten up by adjoining ever-green forest, and is detrimental to the development of the suppressed teak stems? One Conservator last year qualified a suggestion that fire properly controlled and scientifically applied, might be a useful agent in forest operations, as a 'proposal to substitute the instrumentality of fire for the appropriate use of the axe, the saw and the *da* . . . . . the forester's legitimate implements . . . . .'. This is an argument often used, and there is no doubt that, given the time, the money, the labour, and the requisite amount of supervision, the axe, the saw, and the *da* would do the work better than fire; but as none of these necessities are sufficient for more than a small percentage of the area requiring assistance, the argument is not sound. The work *can* be done with the axe, the saw, and the *da*; but it won't be, as there is neither the time, the money, nor the establishment to do it. In course of time I am of opinion that fire protective measures will have to be confined to plantations and such areas as we are able to treat scientifically, and within which we can, every five or six years, carry out works of improvement. Let it be admitted that fire, although doing some damage, also does some good, and let us only supplant it in proportion as we are able to substitute the axe, the saw, and the *da*.

"Fire-protection now is a great strain, both mental and physical, on the whole establishment. From January to May the entire energies of the staff are directed to this one object to the sacrifice of all other work. A stray spark may destroy the labour of months. In one division a gazetted officer was so occupied in enquiring into past fires that he had no time to look after his traces, and he had usually some three or four fires still to be enquired into. Requiring as it does ceaseless and unremitting watchfulness for months, it is work peculiarly unfitted to the Burman, and many subordinates, useful men for other works where there is variety and change, have had to be broken to encourage the others. Excellent results were obtained this year in Pegu, where natives of India were employed, and this system might usefully be extended to other divisions.

"The new rules as proposed make it an offence to set light to any forest in the neighbourhood of a reserve. The natural sequence to this would seem to be an order preventing Forest Officers from lighting fires which they are unable to control when burning their fire traces, and this will necessitate a revised system of work.

"There have been many examples this year of fires spreading from a previously burnt area after an interval of several days. Leaves continue to fall till almost the very end of the hot weather, and it is surmised that when a fresh layer of leaves has covered the ground, the breeze fans a smouldering log into a flame which

is carried by the leaves into the adjoining unburnt areas. If an area of, say, 15 or 20 thousand acres is burnt over, it is quite impossible for the guards to find and quench every smouldering piece of timber or hollow tree. The nearest water is often 5 or 6 miles distant, over difficult hill tracts, and all provisions have to be sent out from the nearest village, which may be 10 miles away. All this points to the danger of *any* fire in the neighbourhood, and I am inclined to think that the agency of fire in making the fire traces will be done away with."

In the Northern Circle, Mr. Hauxwell partly attributes the failure of the year's operations to the fact that a new set of rules regarding fire-protective measures were hastily issued in the middle of the fire season, and were consequently misunderstood and misapplied by subordinates, but the main factor against success, he says, lies in the attempt to protect vast areas quite beyond the capability of the staff available. That this is so is evident from instances quoted, in which it is stated that the fire watchers often had to go two days' journey to call assistance, making it *five or six days* before the assistance arrived. Mr. Hauxwell however believes fire-protection to be worth extending, even at a cost of Rs. 44 per square mile protected.

In the resolution of the Government of Burma, it is stated that "the Lieutenant-Governor does not propose to discuss the merits or demerits of fire-protection, to which two of the Conservators refer in their reports. The problem to be solved is not whether fire-protection is advantageous, but how such protection can be made effective, and on this question His Honour is inclined to agree with the Conservator, Northern Circle, that the area attempted to be protected should be restricted within limits which the officers of the Department can efficiently control. Whatever the views of individual officers may be on fire protection when efficiently carried out, there can be but one conclusion as to the uselessness of measures involving time, labour and money which do not succeed in affording the necessary protection."

Under the head of fire-protection the following paragraph in Mr. Copeland's report is also of interest.

"In the Annual Report of the Southern Circle for last year a senior Deputy Conservator was taken to task for stating the fact now admitted by all foresters of any experience in Burma, that successful fire-protection was not an unmixed good, because conditions were brought about which arrested the germination of teak seed and favoured soft wood species at the expense of teak; and for advocating as a remedy the firing for three to five consecutive years of areas which had been successfully protected for about 30 years. The suggestion was made not without observation on his part of the failure of the improvement fellings, as at present carried out, to produce satisfactory germination of teak. The matter is one of supreme importance in Burma, and ought not to be dismissed with the assurance that things will right themselves

if the requirements of a light demanding species are satisfied by opening out the canopy. Of the necessity of excluding fire when once the seedlings have appeared, there can be no question; but the point to be settled by careful observation in all types of forest is, do improvement fellings result in teak seed germinating to a sufficient extent to ensure the requisite stock of younggrowth?"

With regard to protection from cattle, it is interesting to note that in the Tenasserim Circle "tigers check illicit grazing."

Under the head of natural reproduction there is nothing very definite reported, beyond the fact that it is generally wanting in moist and evergreen forests

In the Pegu Circle it is reported that fire protection favours inferior species and bamboos more than teak, and it is further reported, by Mr. Smales, that after a bamboo flowering, the fire only stimulated the seed! Who can say anything against burning all our forests, root, branch, and fruit, after this?

The usual addition of some  $4\frac{1}{2}$  square miles of taungya plantations was made in Lower Burma to the existing area, but the Para rubber plantation near Rangoon was made over to the cantonment authorities for the entrenchment of nightsoil.

In the Mohuyin Reserve in Katha Division some interesting experiments with reference to teak reproduction were continued. Of the 3,500 seedlings that came up last year on twenty quarter-acre cleared plots, 1,600 are surviving and doing well.

This year, instead of plots, lines 30 feet wide and 10 miles in length, aggregating 37 acres, were cleared of undergrowth, and in June 1900 seedlings appeared. Heavy rain washed away a large number, but at the end of July there still remained 419 seedlings to the acre; the canopy was left intact and the seedlings are kept back by the shade. Under girdlings for the year throughout the province the total number of teak trees girdled during the year was 60,475. The total outturn for the year was 8,333,618 cubic feet of teak, and 20,044,115 cubic feet of all kinds of timber including teak.

By Government agency, 3,023,975 c.ft. teak and 200,000 c.ft. of other woods were extracted, while purchasers removed 5,146,575 c.ft. of teak, and 10,500,000 c.ft. of other kinds of timber.

In the Rangoon timber depôt the average selling price for the year was Rs.77 per ton of 50 c.ft.

The financial results of the year's working are as follows:—

				Rs.
Revenue	...	...	...	67,37,825
Charges	...	...	...	29,63,316
				—————
Surplus	...	...	...	37,74,509

Proportion of surplus to gross revenue 456 per cent.

The average value per ton of teak exported from Burma during the year was Rs.88-8.

The Government Resolution closes with a paragraph commenting on the necessity for additional staff in all branches of the Department. Several new Divisional charges are to be formed, and the Government of Burma proposes to consider what re-organization is needed to cope with existing requirements.

### **"The Woodman's Handbook, Part I."**

THIS is Bulletin No. 36 of the United States Bureau of Forestry, by Professor Henry Solon Graves, Director of the Yale Forest School. It is unfortunately not available to the public at large, and is only issued on a very limited scale, because it contains a number of copyright tables, the use of which was only permitted on this condition. The first volume, which is of a comfortable pocket size, contains rules for finding the contents of logs and standing trees, contents tables, volume tables for different species, method of estimating timber, a brief outline of working-plans, and descriptions of forest instruments. The second volume will contain directions for studying the growth of trees, tables of growth, directions for the study of future production of forests, tables of future yield, and miscellaneous tables, of course, with reference to American species principally.

In the States the cubic foot is little used in practical work. The lumberman has been master of the situation, and all he has cared to know has been the number of running feet of planks obtainable from a tree of given size. Hence the origin of "board measure" and the existence of over forty "log rules" used in different localities. Each of these log rules is based on calculation or on actual experiment of the number of feet of planking obtainable from a given sample-log or set of logs, and no two of the forty can agree as to the number of feet of inch plank obtainable from a given tree, otherwise they could not all exist. When it is added that each rule has two or three different local names, some idea can be formed of the confusion. Many of these log rules are prescribed in the statutes of the various States, but lumbermen seem to conform to the statute just so long as it suits them.

The unit of board measure is the board foot, which is the contents of a board one foot square and one inch thick. So far so good; twelve board feet make one cubic foot, but regardless of waste. A further quite arbitrary deduction is made by estimate in case of defects if any exist. There is also frequently a unit of sale, called the "market" or "standard." This is a log twelve feet or thirteen feet long, and 19, or 21, or 22 or 24 inches thick at the small end inside bark, as the case may be. The utility of the "standard" is not clear. To the outsider it would appear that the hundred or the thousand of running feet would be infinitely less complicated. Only long pieces are measured by the foot cube when used for spars or square timber.



Firewood, small pulpwood, and material cut into short sticks for "excelsior" (whatever stuff that may be) is usually measured by the cord. A cord is 128 cubic stacked feet. If in 4-foot lengths, the cord is 4 feet high and 8 feet long. If it is 5 feet long the cord is 4 feet high and  $6\frac{1}{2}$  feet long. If it is pulpwood 5 feet long the cord is 4 feet high and 8 feet long. If cut shorter the cord is still 4 feet high and 8 feet long, but the price is cut shorter to match. A "cord foot" is an eighth of a cord, that is, 4 feet high and 1 foot long. A "foot of cord wood" means a "cord foot." A "surface foot" is as measured on the side of the stack. Cordwood is sometimes measured with callipers. Instead of stacking into cords, the average diameter of each log is taken, and the number of cords found from a table expressed in "cylindrical feet." The "cylindrical foot" is the same as the "stacked cubic foot," or the 128th part of a cord. The cubic contents in cubic feet cylindrical is found by squaring the average diameter in inches, multiplying by the length in feet, and dividing by 144.

The chapter on estimating standing timber is short but practical. The term "cruising" is used to denote the systematic manner in which the valuer extends his operations from one place to the next. Tally sheets are used instead of note-books. Several methods of taking heights are given and illustrated, together with various instruments used. There is a specimen map, and altogether the handbook will be one of the most useful and valued possessions of the American forester.

## V.—SHIKAR AND TRAVEL.

### The Long Round to England.

THE journey home from India by Japan and North America presents many lines of interest. The reverse tour has already been described in these pages in the last few months, from what may be called the social side, and no apology is needed for the following account, dealing mainly with the forests of the countries traversed; indeed, some description is due both on account of the exceeding courtesy and kindness which the writer received from the forest authorities, and of the interest of the many different forest scenes which passed rapidly before his eyes during the four months spent on the way. By personal explanations, by maps and pamphlets given with a generous hand, the authorities endeavoured to give a full, general but concise impression of forest conditions; but the areas and interests involved are vast, and the writer feels that he only entered the ante-rooms of huge buildings and that what he saw in them was only imperfectly focussed to his eyes.

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"The photographs show a virgin forest of *Cryptomeria Japonica* and a plantation 8 to 10 years old of *Cryptomeria Japonica* and *Chamcecyparis obtusa* with a 40-years old plantation of *Cryptomeria Japonica* behind."

## PART I.—THE FAR EAST.

## FROM INDIA TO JAPAN.

Starting from Northern India, then, the journey to Tuticorin by rail through Bombay and Madras affords an interesting glimpse of the variety of the conditions of life in certain provinces and Native States, as also of the forest vegetation and its treatment, but it is not recommended at the end of March on account of the heat. Poona and Cuddapah were passed through at night. The scrub forests of Lalitpur and Madura are a pleasing contrast to those—or their remains—of parts of the Deccan. The instinct of forest conservation is instilled not inborn—is a truth which impresses itself incessantly on such a journey as this. Fortunate are those nations which, when their instinct is appealed to, still have valuable forests in their midst, for they can quickly grasp its value.

A three days' wait at Colombo for the North German Lloyd *Bayern* was pleasantly turned to account in a run up to Kandy and the Peradeniya Gardens hard by. After the vegetation of the dry hot plains of India, the luxuriant growth and the dense vegetation of the damp heat of Ceylon are a revelation. The soft-moulded Cinghalese also form a strong contrast to the men of Northern India. The Gardens are world-famous and well worth a visit by any one, whether botanist or not. Our voyage to Nagasaki was varied by stoppages at Penang, Singapore, Hongkong and Shanghai, the last three being of special interest and having their commercial prosperity stamped very plainly in their busy streets and population. At Singapore are good Botanical Gardens. At Hongkong the slopes of the Peak have been planted up with temperate species to a considerable extent. A two days' wait at Hongkong was sufficient for the highly interesting short trip to Canton, which should on no account be missed if the opportunity for making it occurs. The numerous narrow streets with deep open-fronted shops, of excellent quality and great variety, the river full of craft, the walls with their obsolete guns, and the Chitaman in his own home are the chief sights. One or two timber-yards were cursorily visited. All the larger building timber seen was of a fast-growing pine floated down the West River from some distance upstream in baulks about 15' x 16' x 18' or in the round. The houses are of grey brick, but there is much timber and bamboo work in them. Inasmuch also as fuel shops were seen alternating with the better class shops in the city, that trade is evidently profitable. The orders against the illicit cutting of trees in the neighbourhood are said to be strictly enforced.

Of Shanghai, the shipyards, the river front in the international quarter, the red brick suburban residences, and the poplars and willows which form a large percentage of the roadside trees remain engraved on the writer's memory. Thence the *Siberia* dropped again down the discoloured waters of the Yang-tse, and a

bitterly cold three--days' passage brought us to the first port in Japan, Nagasaki. Another thirty-six hours, through the Straits of Shimonoseki and the beautiful Inland Sea, and we were landed at Kobe.

#### JAPAN.

It is not the writer's intention to describe again the beauties of Japan. Hundreds of pens have attempted it. Suffice it to say that owing to the extreme kindness of the authorities in deputing an officer of high standing for the tour of twenty days, and to the untiring zeal and never-failing attention of the latter, a considerable amount of ground was covered between Kobe and Aomori in the north of the main Island, and all difficulties of travel and living were smoothed.

Our time was equally divided between town and country, in this case forests,—a course strongly recommended on account of the contrast of life and variety of scene presented. The town and city life, the ancient castles and palaces, the shrines and temples built almost entirely of wood, and in which some of the finest and most massive woodwork is to be seen, the narrow streets with their small wooden houses, the picturesque busy population are all strange, all int-resting. To the European the charm of Japan lies in its nearness to the feudal past and the quaint ceremonies and other artistic reminiscences of that past, as well as in its beautiful scenery, while our interest is stimulated by the energy, too imitative it may be, and manufacturing enterprise by which the nation has brought itself up to a modern standard. Two opposite examples come vividly back to us—the cherry-blossom dance, performed in Kyoto, whose delicate but brightly artistic charm, together with that of the tea ceremonies preceding it, must be seen to be in any way appreciated, and, on the other hand, the extreme development of the telephone service in the principal streets of the commercial city of Osaka, partly no doubt on account of the want of locomotion other than pedestrian. As forestry in Japan is a sealed book to most foresters, our wish is to give here a general idea of the country in reference to its forests and of the work and organisation of the Forest Department. Of the forest areas belonging to the State, only those of the main Island, Nippon, and of Shikoku and Kinshin are under the Bureau of Forestry, whose headquarters are at Tokio. Those of the Northern Island, Yezo or Hokkaido, and of Formosa are under the authority of their respective Governors. The following remarks have reference to the first three islands, and especially to Nippon.

#### CLIMATE AND LOCALITY.

In its situation and relation to ocean currents Japan is well compared with the British Isles. The first is however considerably bigger in area, and owing in part to its greater length and want of compactness the difference in temperature between Yezo and Kinshin is large. Yezo is within the same isothermal lines

as the north of the British Isles and the south of Norway, while Kinshin and the southern shores of Nippon have Mediterranean temperatures. This agrees with the writer's experience of the strength of the sun in the first half of May. Walking in the valleys in Nippon then is less pleasant than riding in a rickshaw. The Japanese frequently use umbrellas in the sun in May, by no means the hottest month. The rainfall is large. In practically no part of the main Island is it less than 40 inches and in a considerable area it is over 100 inches. Where the State forests lie thickest it would appear to be generally between 50 and 75 inches. It is spread well over the twelve months. Japan has thus a fine growing climate for forests.

It is also a country of great undulations and high mountains. Corresponding with the ever-present hills is the depth of water close inshore, the passage of large steamers through the narrows of the Inland sea is a striking illustration of this. In the well-known book *Things Japanese* it is stated that only 12 per cent. of the land is cultivable, but the percentage within the three islands is probably larger. Be this as it may, the fact that 55 per cent. of their surface is estimated to be still under forest, though the large population of 40,000,000 Japanese is mainly dependent on the land, is sufficient proof of the mountainous nature of the islands. The geological features appear to be very varied. The western portion of the main Island is largely of tertiary or recent formations, with lower but still very considerable elevations. In the eastern and north-eastern parts, as a result of greater upheaval in conjunction with or as a consequence of gigantic igneous forces at work, the mountain ranges are higher, with many peaks of 6000 feet to 8000 feet and the older rock series have been more largely exposed. Within comparatively small areas the variations of the strata and rock formations are very great, metamorphic action having also played a large part. In this portion of Japan the now extinct volcanoes thrust themselves prominently before the interested eyes of the traveller, some of them being very fine. Such are the leading characteristics of the locality and climate, and grazing, as contrasted with the same in India, being almost nil, it follows that there are no hindrances to a soil covering of sufficient depth and freshness, while numbers of streams and rivers descend from the hillsides to water the rich cultivation on their lower slopes and in the valleys and plains of moderate area, which lie with few exceptions towards or along the seashore.

#### ECONOMY OF LAND.

The landscapes of Japan are invariably pretty and interesting, the first owing to the general features already mentioned and the second owing to the careful economy of land, especially culturable land, practised for many generations past. The largeness of the landscapes forms a somewhat curious contrast to the life of the Japanese, the chief characteristic of which is its minuteness both in the arts and in many other aspects. All the

culturable land is highly cultivated, and where possible irrigated by canals, wells or tanks, and in the warmer south two crops a year are taken off it. The mulberry is largely grown, and the bark used for paper and the leaves for the propagation of silk worms. As already mentioned, the greater part of the population is agricultural or rural. The picturesqueness of the country districts is much enhanced by the numerous pretty and neatly built villages; while the low lands hold rich cultivation, interspersed with bamboo plantations and in some parts with small wood-lots. *Speaking generally*, the low hills nearly adjoining the cultivation are covered with tree-growth and will be found of to belong to small owners, as is evident from the patchy aspect the hillsides, while the slopes of the mountains rising behind are used as grazing grounds and are bare of forest growth or else are clad with forest and belong to the State or large private owners. The quality of the woods belonging to small owners naturally varies greatly. On the whole they are young. Of those seen in Nippon, a large portion were of red pine of middle or younger age and of artificial origin; there is also much coppice forest of mixed broadleaved species, oak, beech etc, on a rotation of about 20 years, and plantations of *Cryptomeria Japonica* are also common. Some of the young red pine woods are of the best quality. Near Tokio much of the culturable land in the plain is kept under such forest by private owners, owing to the big demand in the capital, and also without doubt to the low assessment on forest land. In the western part of Nippon on the sandy soils the pine forests on the hills are of large extent, but much denudation of the soil has been caused by the national system of clear cutting, which, however, is now being repaired to some extent by artificial regeneration. The State forests mostly lie in the northern part of the main Island, which is cooler and more mountainous. The lower slopes of the mountains are largely given up to grazing, large numbers of horses being bred in the north.

The land tax is  $3\frac{1}{2}$  per cent. of the land value on cultivation, but the remainder, including private forests, is very lightly assessed.

The area of the three islands, Nippon, Shikoku, Kinshin, is about 120,000 square miles. Of this the forest area is about 65,000 square miles, of which 25,000 square miles is State forest, the remaining area being made up of a considerable area of Crown forest, some small municipal forests, areas belonging to the Church, and other private forests.

#### PRINCIPAL FOREST TREES.

Chief among the coniferous species in these islands are *Cryptomeria Japonica* (Sugi); *Chamaecyparis obtusa* (Hinoki); *Pinus densiflora* (Aka-matsu, red pine) widespread; *Pinus Thunbergii* (Kuro matsu, black pine) chiefly along the shores of the Inland sea; *Thujaopsis dolabrata* (Hiba), *Abies firma* (Momi). Among the

broadleaved species *Quercus serrata* (Kunagi) and several other oaks, and *Fagus sylvatica* var. *Asiatica* (Buna) form a considerable proportion of the coppice forests, and the latter mixed with conifers occurs in high forest. The most valuable species in high forest are *Telkowa acuminata* (Keyaki) and *Cinnamomum camphora* (Kusu-noki, camphor). The first grows to large dimensions (5 feet diameter, 100 feet height) on volcanic soil in mixture with oaks and has something of the appearance of beech. The timber is considerably like teak in appearance and quality. Camphor grows in Kinshin and in large quantities in Formosa. The timber is finely grained and grows to large dimensions. Of the conifers, Sugi, Hinoki, Hiba are all fine-grained timbers.

#### LIFE OF THE PEOPLE AND USE OF WOOD.

It is desirable to add a few lines on the life of the Japanese in its bearing on the forests and the forest question. A very large majority of the houses, both in town and country, are built entirely of wood with tiled roofs. The houses are small. The timber used is mainly coniferous—red pine for the poorer class and *Cryptomeria* and *Thujopsis* where the more valuable kind of timber is required. In the rural districts the roofing is often of bark, especially that of *Cryptomeria*.

The woodwork is simple and, except in the north, very neat and artistic and often beautifully polished. Strange to say it is almost all done by hand, there being only some five or six saw-mills in the country. The carpenters' tools too are decidedly primitive, the hand saws being very short and deep bladed. Much of the best woodwork of large dimensions is seen in the numerous Buddhist and Shinto temples, where large beams and pillars of *Cryptomeria* and *Telkowa* are seen being inspected with much interest by the Japanese.

Among some of the other principal uses of wood, barrel staves are split in the forest from pine and *Cryptomeria*, matches are made in Kobe from wood from private forests, tea-boxes, now being largely exported to Ceylon, and chopsticks are made of the wood of *Abies formosa*. Shingles are also largely turned out. Little paper pulp is made at present, paper being prepared chiefly from mulberry bark and straw. Charcoal is burnt from twenty different species, including oaks, and is very largely used for heating and smoking urns. Clogs, which with grass sandals are almost universally used instead of boots, are made from the wood of Kiri, a fast-growing tree which is largely grown in open groves round villages.

The demand for wood of all kinds is thus very great, and at least in private forests there is a continual tendency towards lowering the cutting rotation. Partly no doubt this is the effect of the extensive cuttings which took place in the years succeeding 1868 (which are referred to again later on); and it is so in spite of the planting work to replace clear cuttings, both of which are parts of the national system or instinct of forestry. The

prices of timber are somewhat high, those of *Cryptomeria* and *Chamaecyparis* being roughly 6*d.* per cubic foot and pines about 3*d.* Railway rates are approximately  $\frac{1}{4}$ *d.* per mile per ton.

#### GOVERNMENT.

As in other civilised countries, there is a central Government with offices or departments, and the heads of the latter are selected from the political party having the majority in the two representative bodies, the Upper and Lower Houses or Diets, and compose the Cabinet. The members of the Upper House have a more important share in the Government of the country than is the case with the House of Lords in Great Britain. The members of the Lower House are salaried. The Department of Agriculture and Commerce is represented in the Cabinet. The Bureau of Forestry is one of its branches. Two of the secretaries of the Bureau are present in the House during the parliamentary session to give information as it may be required.

Very important to the well-being of the rural districts and of the forests as a whole is the division of Japan into prefectures or ken, of which the three islands referred to here contain thirty-five. The Governors of ken have important administrative and legal functions, with branch offices of various departments under their control. They have no jurisdiction over State forests. In only four or five of the ken as yet are there forest offices for "civil" forests; these are concerned with the management of experimental forests for the benefit of village communities and for the encouragement of planting or sowing by a free distribution of plants and seeds or the same on payment. In all prefectures there are now restrictions on cutting on sandhills or at sources of streams, but not at present very rigidly enforced. Conservators of State forests advise in this. A short description of prefectural schools for instruction in agriculture and forestry is given later on.

#### PAST HISTORY OF THE FORESTS.

In order now to understand the present condition of the State forests and their origin as such, as well as the evolution of the Bureau, we must go back a few years.

The retirement of the Shoguns and restoration of the Mikado to the actual government of Japan in the year 1868 is for the forests, as for all else, the critical point in the modern history of Japan. Up to that date there survived feudal Government under succeeding Shoguns, who, though in each case nominally the principal feudal lord, actually and hereditarily ruled the country for several centuries. Such a system was an impossible survival in these modern times, unless the country remained closed to foreigners, and when the United States and European Powers insisted upon it being opened to freer intercourse, the Shogun and the feudal lords (or Daimys), retiring from power, gave up all political and private rights of lordship, and a complete change and modernising of the Government came about, which is hardly yet

complete. The laws had to be newly codified among other upheavals of old institutions, and it was twenty years or more before the conditions of rights of property were finally settled.

The effect of such a sudden change on such property as the forests can easily be appreciated. Under the feudal system stability and a continuous policy were guaranteed, the forests were preserved with considerable care, and planting was practised, but so soon as restrictions were removed and they became common property, very heavy cuttings were made by neighbouring villagers and landholders in all within easy reach of the market.

It was in the year 1878 that the question of the reservation and administration of the national forest property first came into prominence. The prime movers were officials assisted by some public spirited men, among them the famous Count Yamagata, but there was much opposition from the villagers and other private interests. At that time the distinction was drawn between the private and State forests and somewhat rough maps were made illustrating these and their boundaries. Up to 1885 the State forests were administered by the Governors of Prefectures, and in that year the staff of management was first organised, twenty-one circles being formed and placed under the Department of Agriculture and Commerce. A first forest school for the training of rangers had been started in 1882 at Nishigahara. The important association of private owners and others interested in the welfare of the forests, the Forestry Society, came into existence about this time.

#### FOREST LAWS.

The necessity of enacting forest laws was quickly felt. The first draft was made in 1882 by officers who had returned from training in Germany, but it was too advanced for the general conditions of the country and the incomplete state in which general legislation then was, and thus the so-called common Forest Law was not promulgated until 1897. It deals with State, crown, private, municipal forests and those belonging to religious bodies, and places certain restrictions on the cutting and cultivation of those of the last three classes. Its enforcement lies with police and forest officers, who have powers of arrest and of taking evidence. The maximum punishment is two years' imprisonment or payment of double the value of the produce concerned. A second law called the State Forest Law, dealing among other things with the part interest of private persons in State forests, was enacted a year or two ago.

#### PRESENT ORGANISATION OF THE FOREST DEPARTMENT.

The organisation of the Forest Department in Japan and the management of the forests are based in the main upon the German model, but both are as yet incomplete, and the organisation is at present very central, mainly owing to numerous claims to forests and forest land put forward and not yet decided, and to the



want of a full-trained staff, especially in the subordinate establishment, and the difficulty in obtaining satisfactory recruits. In several respects the position is analogous with that in India nearly twenty years ago.

The Forestry Bureau or central administration is divided into five branches, each under a Director with twenty or more clerks, the whole being under the Director-General of the Department. The branches are those of general administration, accounts, forest works (survey, working plans, plantations, demarcation), miscellaneous (chiefly appointments and personal matters) and special claims. For a clear understanding of the state of things, it must be explained here that owing to the manner in which the old feudal system passed away and to the position and proprietary status of the Church, no fewer than 22,000 claims affecting 10 per cent. of the whole area of State forests were put in by corporations and private persons of all kinds, especially to the more valuable portions. The special claims branch, appointed five years ago, has dealt already with 12,000 of the smaller claims, and the Upper Diet has now ruled that all claims must have been first presented within the five years, 1868 to 1873, and must be supported by written evidence. But though the work has been thus far simplified, it is still extremely complicated, because adequate records are available from long periods of time, particularly in the case of religious houses. Many large interests are involved in these claims, the splendid old cryptomeria forest at Koyasan, which was visited by the writer, and which surrounds an ancient burying ground, being the object of one of them, but only about 6 per cent. of the decisions have so far been carried on into the law courts. This great work has been grasped by the authorities with their usual energy and affords an extremely interesting instance of the difficulties presented in evolving the new state out of the old.

The other abnormal feature in the organisation lies in the existence of certain small State forests which it is not desirable to keep as such, and in the method of their sale between the years 1900 and 1913. By this means a special account is obtained of £200,000 per year, which is spent in surveying, plantations, working-plans, demarcation and the establishments involved. The gross revenue from the common account or ordinary sales of produce from permanent reserves, which in 1885 was £35,000, was £200,000 in 1897, and has since increased; but the surplus is not large after paying for the ordinary executive establishment. Clearly, to complete and keep up some of the important special works, a second special account may be required after the year 1913. With regard to this, normal expansion of revenue may do sufficient, as it appears that forests not under detailed working-plans are not being fully worked.

As regards the forest works branch and its results in the office and in the field, rough working-plans were completed ten years

ago for all State forests. Such a plan was seen which deals with a Conservator's charge of 29 ranges, and shows in the tabular statements the areas to be worked and volumes of produce to be cut in clear cutting, selection, and coppice working circles. The working-plans branch was inaugurated four years ago. Since then 300 square miles of forest have been put under detailed plans, the average area covered by a plan being only 10 to 15 square miles. The working-plan maps are on the scale of 1 : 5,000 and very detailed. Without any doubt, the units of area dealt with are much too small and the maps too detailed, considering the circumstances of the Department. The working-plans control required when any large proportion of the forests have been put under plans will be beyond the strength and resources of the staff. As regards the surveying of the forests, the survey of Japan was formerly solely a function of the Military Department, and so far as the forests had been dealt with the results have been adopted. In the special forest survey branch military officers were at first employed, but not latterly. Of the trigonometrical portion all except the N.-E. part of Nippon has been completed, but no maps have yet been printed. The scale of lineal survey is 1 : 5,000, of trigonometrical survey 1 : 20,000.

The plantations branch of the Bureau has been in existence for only four years, but regular plantation work has been done in the forest since 1879. As the most valuable forests are coniferous and the principal system of cutting is clear felling, the plantations are very important. In all 200,000 acres have been planted up in the last twenty-four years, two-fifths of this area being planted under the special account since 1899. The average cost of all plantations has been 35 shillings per acre.

The forests are divided into sixteen circles or Conservator's charges of an average area of 1,600 square miles. In each circle there are on the average six Assistant Conservators, one of whom is a gazetted officer, twenty rangers and eighty-four forest guards; the number of beats averages seventy-five to a circle. These are all paid out of the common account, and the special experts in charge of working-plans, etc., paid from the special account, also mostly work under the Conservators. The Japanese forest officer gets less pay for his work than his more fortunate Indian confrère. Of the officers just mentioned none get more than £250 or less than £12 per annum. Gazetted officers commence from £80 a year.

#### FOREST EDUCATION.

The last point in the organisation which will be noticed here is the education in forestry which is given to the youth of the country. This is again upon the German model, and the essence of it is that forestry is looked upon as a national business, and it is considered that instruction for various classes of pupils and of various degrees is necessary. The principal institution for higher instruction is the Komaba Agricultural and Forestry College of the

Tokio University, which, as far as forestry is concerned, originated in the Nishiguhara School. There are two classes for university graduates and for non-graduates. For each there is a three years' course. The usual subjects are taught. There are eight professors of forestry, some of whom have studied in Europe, but they have not done executive work. About thirty students commence the course yearly in each class, it is said. Pass marks are 60 per cent. of the total with a minimum of 50 per cent. in any subject. The tuition fees are only five shillings per month. Ten stipendiary students are paid £1 per month from the Bureau of Forestry under a promise of taking up service in the department. The usual nurseries and some small specimen plantations are attached to the college buildings. Practical forest work is taught besides in March and December, and the summer vacation (voluntary work) in the experimental forest of 9 square miles belonging to the college 50 miles from Tokio. There is another forest of 90 square miles in Hokkaido belonging to the college.

Graduates of the Forestry College entering Government service join as Assistant Conservators (provincial) or special experts. £3,000 a year is devoted to the deputation of officers to foreign countries to study markets and learn methods.

Other higher schools of agriculture and forestry are at Morioka and Hokkaido.

A very interesting visit was paid by the writer to a secondary school, that for the instruction of agriculture and forestry in Nara Prefecture. Owing to the importance of forestry in the latter there were at the time of the visit 120 students of forestry and 80 of agriculture, the children of small farmers and private forest-owners, and averaging 16 years of age. Instruction is free and the course for three years, with an entrance examination. The lectures are chiefly on forest works, the students being taught practically in the 2nd and 3rd years the theories expounded in the first. An experimental forest area of 250 acres is provided from prefectural funds. This school is the latest development of the system, and contains a more than ordinary proportion of boys studying forestry. Ample class rooms and students' quarters are provided in a long low quadrangular building.

#### IN THE FORESTS.

On a short tour it is not possible to get more than a glimpse of the woods of a country. On the other hand the first few days are inevitably richer in novelties than those succeeding, and a few notes on the silviculture and management as well as exploitation of the forests especially visited will be of interest.

#### CRYPTOMERIA JAPONICA.

The most valuable woods in Japan are those of *Cryptomeria Japonica*. This is the tree, as is well known, which is particularly associated with temples and cemeteries, either surrounding them or in long avenues leading up to them, as at Nikko, Koya-san, etc.

**INDIAN FORESTER.**



**CRYPTOMERIA JAPONICA.**



The largest specimens seen were estimated to be 5 to 6 feet in diameter and nearly 150 feet high and several hundred years old ; as forest trees a diameter growth of 3 feet and height-growth of 100 feet are general limits in old natural woods. Although some of these fine old woods remain in the north or as appurtenances of religious houses, the very great majority of the *Cryptomeria* woods now standing have been planted. In the old woods seen in the Akita conservatorship the canopy, is on the whole of fair density and the trees are branched somewhat low down, and the absence of natural reproduction is very striking. This may be due to the extreme wetness of the soil covering. The root system is very shallow. In the natural woods, the mixture of other species with the *Cryptomeria* is very small. *Abies firma* is one of them. In Akita much reproduction of a *Cephalo taxus* sp. (dwarf yew, was noticed. The woods in Akita are now being treated under a rotation of 100 years, under which a maximum diameter growth of 2 feet and mean growth of 1 foot 8 inches is expected. Private forests are treated on a rotation of 60 to 80 years. The *Cryptomeria* forests, like most other coniferous forests, are subjected to clear cuttings: the point to which this system is carried in Japan on steep slopes opened our eyes very wide. Taken as a whole, the results are very excellent, except in the pine forests on sandy soils already noticed, where a rational system is required badly.

In the *Cryptomeria* forests seen, the area of a clear cutting on steep ground was probably nowhere more than 15 acres.

These *Cryptomeria* forests are replanted mainly with *C. Japonica* and *Chamcecyparis obtusa* (Hinoki). The latter is planted in the poorer soil and on the ridges, the former in the hollows and damper ground. In middle class soil both are mixed. The *Cryptomeria* naturally grows the faster of the two. In districts in which thinnings sell well the plants are put in very closely—at 1 metre interval, subject to good quality of soil in the planting spots. Transplants of the 3rd year are planted one year after felling. Thinnings commence early, from the 12th year, and are at first frequent, the first thinnings being sold for walking sticks. The young woods have the appearance of being heavily thinned. Rope and sticks are freely used to support weak stems against snow! A 30 years' old plantation of pure *Cryptomeria* of good quality was estimated to have 400 stems to the acre of an average height of 45 feet and diameter of 8 inches or 9 inches.

In some well-known woods belonging to an owner of advanced ideas, a large and highly successful plantation was seen which had been made recently on an upper grazing ground leased for one rotation from a village. Where the woods are favourably situated no part of the *Cryptomeria* tree is wasted. The root wood and branch wood is exported, the former being used for barrels and roofing, while the twigs and needles are used either for fuel or as a fertiliser in the plantations, being spread over the soil.

### THUJOPSIS DOLABRATA.

Another interesting trip was one made to a natural forest of *Thujopsis dolabrata* (Hiba), a beautifully smooth-grained timber lasting well under water. The Japanese Beech is largely mixed with the Hiba at the upper elevations, but its timber is only just coming into use, and it is being cut out and Hiba planted instead. The forest was heavily cut over under the prefectural régime, but was protected before 1868. The Hiba grows up to about 90 feet on good localities, the most suitable soil being that derived from pure sandstone. The forest is being treated under the selection system. Natural reproduction is moderate, and where not sufficient, branches are cut and planted either just before the snow falls or after it melts. As the snowfall is very heavy, cutting is done after it is completed and has hardened, and it is dug out round the trees to be felled. The stumps left are cut again in the spring. Plantations of Hiba are of about the same quality as those of *Cryptomeria Japonica*.

### EXPORT.

The export arrangements in Japan present no novelties except the dams shown in the above forest. These dams are made of timber and earth, and the sluice-gates consist of two sets of planks laid loosely longitudinally and one above another to form the gates; the outer end of each plank is tied separately by rope to the side of the dam, and the inner ends rest against a pole slanting slightly inwards towards the pond and also tied above to the dam. This pole is wedged in position by another thinner pole, so that when the pond has been filled with water and logs and the latter pole is pulled out, the remainder of the gates swing free and water and timber pass on to the next dam perhaps a mile further down. In this way the water in the small streams is used to the greatest advantage when the timber is being exported in the spring. The writer was very kindly given the opportunity of witnessing the working of these dams.

### THE FUTURE.

A word as to the future. Japan is essentially a great forest growing country. If all the possible culturable land or that required for pure grazing is taken out, a very large area suitable only to forest remains. Furthermore, the "leads" to the sea are short. Its future therefore as a great timber exporting country seems absolutely certain, as China alone will absorb all the timber offered to her. For the present Japan will probably find the machine cut wood from the Western States of America competing severely in the markets with her products, and besides she has not or ought not to have much to offer. At present too, the Bureau of Forestry has its hands full with the setting of its house in order, but it must eventually, perhaps after long years, become one of the most important departments in the Government, both as controlling the destiny of a large portion of State property and



**A DAM.**





as the leader or expounder of the best policy for the working of the very large areas of private forest in Japan.

It is the pleasure of the writer to place the information as kindly given him before the readers of this magazine, hoping that it may add to the interest aroused in all who visit the delightful home of our allies the Japanese.

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### The Bison

As an old shikari, I read with interest the remarks of "Solid Lead" about the Bison. Rifles have changed since my time, but the bison has not, and perhaps the following account of an incident that happened to myself may be of some interest to your readers.

It was about the end of April or early in May 1863 that I was prospecting for the Boree Forest Reserve, and my work took me on to the low hills which extend from the Sonebudi Gorge westward to the Machna. It was late in the afternoon and I was not in quest of game, but had with me an old double Westley Richards rifle, 12-bore, which carried a belted ball and not more than 3 drachms of powder. It was not a powerful weapon but good enough for a chance shot at a sambur or such like animal. Going along I came on the track of a considerable herd of bison, and noticing that a solitary spoor left the rest and went towards two or three small conical hills close by, I followed it up. I crossed the neck between two of them, and was going down the slope on the other side, when a large bull bison got up and stood some 20 or 30 yards in front of me. I got my rifle and fired at the joint of his shoulder. At once he came straight at me *with his head down*. Of this I feel quite sure even after the lapse of years. I gave him the other barrel, which did not stop him at all, and swung myself up into a small tree that was close by, and the bison passed under my legs. Just at that moment my syce crossed the neck and was coming down the slope with my pony. He let go the pony, which bolted across the neck, and fled. The bison caught him fair behind with his nose and pitched him a good half dozen yards, and without stopping bolted across the pass and escaped. The man was not really hurt at all, beyond bruises and a scalp wound of no importance. But in attending to him and getting water time passed and the night fell, so I never saw the bison again, but his tracks showed that he had joined the herd which moved off altogether. The whole thing from first to last did not occupy two minutes, but I have a perfect recollection of it, though it happened so long ago.

Now the question arises, did the bison really charge me? Or was he only using his natural way of escape to join the herd? Forsyth, who alludes to the occurrence in his *Highlands of Central India* always maintained that it was no real charge. Beyond the fact that he came at me, with his head down, I cannot positively say. Perhaps "Solid Head," who certainly knows something about bison shooting, will kindly give his opinion.

G. F. PEARSON.

## VI.—EXTRACTS NOTES AND QUERIES.

**Myrobalans.**

IN our weekly market reports are given the current prices of myrobalans, or "myrobollams" as the older name is spelled; but it seems that outside of a limited circle of interested traders the term is little understood and the article itself is of little importance.

Myrobalans is the commercial name given to the dried fruits of *Terminalia chebula*, a tree found distributed all over the plains of India. The name is derived from two Greek words signifying "juice" and "acorn." In the vernacular they are called *hirdus* or *harras*, because the tree is supposed to have been introduced into the country by Dhantari, the physician and devoted worshipper of Shiva, from the abode of Hara. Myrobalans constitute the most important tanning agent shipped from India; the exports for the past five years averaged 34 lakhs of rupees, and for the year ending in March 1903 they realised 37 lakhs. The fruits are a forest product of Bengal, Madras, Bombay and the Central Provinces, and are largely collected in the dry season when they are mature. Myrobalans are exported from Bombay, though smaller shipments are made from Calcutta and Madras. Great Britain receives about half the total produce, Germany one-quarter, Belgium one-eighth, and the rest of the nations of the world divide the balance between them.

The fruits or nuts are about the size of a pigeon's egg, some varieties being round in shape and smooth, while others are more elongated and wrinkled; some are yellowish in colour, others are greenish, brown, or nearly black, some nuts are tough and waxy when cut, others are dry and brittle. The outer portion of the fruits is the most valuable part, as the hard stone within contains no astringency. In English there are five chief varieties of myrobalans called after the districts in India from which they are obtained. These are "Bhimelies," from Bimlipatam in Madras; "Rajpores," "Jubblepores," from Jabalpur in the Central Provinces; "Vingorlas," from the Bombay forests and "Madras Coast." The price and quality of these nuts vary exceedingly, whilst the opinion as to their actual value in the tanning trade is widely conflicting. Some tanners maintain that Jubblepore myrobalans, or J's as they are technically called, are worth more than Bhimlies, or B's; while others are equally strong in their preference for B's in comparison with J's. Some tanners prefer the light green colour nuts, which are higher priced than the others, while some prefer the dark or browner kind. One remarkable instance is recorded of a tanner who rejected a delivery as being darker in colour than the sample, and on arbitration secured an allowance of £1 per ton. It was afterwards found that the myrobalans were 3 per cent. stronger in tanning than the original sample

which, in the opinion of the arbitrators, was worth £1 a ton more than the delivered bulk. Some tanners buy myrobalans for their strength and cheapness when compared with the price of oak-bark and valonia, others use them on account of their brightening colour, while others use them because of the light-coloured bloom they deposit on leather.

Myrobalans thus present an interesting problem in which the science of chemistry could assist the tanning industry in pointing out how far the price and quality of the material is controlled by the actual composition. It is, therefore, with pleasure we have read in a recent number of the journal of the Society of Chemical Industry, a paper by Dr. J. Gordon Parker and Mr. F. A. Blockey, on "The relative tanning values of different species and growths of myrobalans."

The investigation was undertaken with the object of ascertaining the exact qualities possessed by the different varieties; which was the strongest in tanning; which variety gave the most bloom; which produced the most acid; and to ascertain the difference in colour imparted to the leather.

The first part of the work was to show by the standard method of analysis, the contents of tannic acid in the different samples, each calculated to contain 12 per cent. of water. The results are shown in the accompanying table :—

				Tannic acid.
Picked Bhimley	..	..	..	33.0
Bhimley 1	..	..	..	38.4
" 2	..	..	..	35.2
Picked Rajpore	..	..	..	32.2
Rajpore 1	..	..	..	35.4
" 2	..	..	..	27.6
Picked Jubblepore	..	..	..	28.9
Jubblepore 1	..	..	..	36.5
" 2	..	..	..	27.3
Vingorlas 1	..	..	..	31.5
Fair Coast Madras	..	..	..	34.8

It will be noticed that B. No. 1 appears to contain more tanning than any other variety, followed by J. No. 1 and R. No. 1.\* It would appear that the colour of the fruit is in no sense an indication of the tanning value. The samples picked by hand for their appearance were not only weaker in tanning, but gave darker solutions, the resulting leather also being of a darker colour. These experiments point to the superior value of the nuts that are left to mature and fall off from the tree by themselves.

The next portion of the research was to ascertain the extent of the bloom present in the myrobalans. The authors point out that one of the chief attractions of the nuts to the sole leather tanner is their bloom-yielding capacity. When these

\* It is a strange fact that the picked varieties, which fetch a higher price in the market, are considerably lower in tanning strength than the No. 1.

tanning extracts are allowed to stand for a few days, a deposit of "bloom," or properly speaking, majic acid, settles at the bottom of the vessel. The samples were therefore treated under tannery conditions, and the amount of deposited matter was separated after 7, and again after 17 days' rest and carefully weighed. The results showed that Jubblepore and Vingorla myrobalans were distinctly superior to all the others from the amount of bloom they yielded and the readiness with which their solutions deposited it.

With regard to the question of acidity, it should be explained that the amount of natural acid present in modern tan-yard liquors is in many cases less than was formerly present, and various means are resorted to in order to increase the amount of acid in the liquors or decrease the amount of lime retained by the hides. In the latter case, the use of boracic and lactic acids for surface deliming has increased enormously of late. One of the best materials for the former purpose and one which is perfectly safe in its actions is myrobalans; a certain quantity of myrobalans is added to the handler liquors in the sole-leather tanneries, and sufficient acid of a soluble nature is afterwards naturally developed.

In testing the acidity of commercial samples it was found that the Bhimley variety developed most acidity and the Jubblepore myrobalans developed the least; the former therefore are distinctly superior for the purpose of increasing the acidity of the suspenders.

The authors finally attach commercial interest to their results by calculating the price of the unit of tan in the samples examined. Messrs. Fisher, King & Co. supplied the list of maximum and minimum prices for the past season, which are liable to variation from year, to year, on account not only of the demand but also of the good or bad harvests in India; and the authors show the value of the unit of tan in each sample of the myrobalans as follows:—

		Average prices		Price per unit	
		per cwt.		of tan per ton.	
		s	d.	s.	d.
Picked Bhimley	..	..	7 0	4	8½
Bhimley 1	..	..	6 7½	3	5.8
" 2	..	...	3 11	2	2.6
Picked Rajpore 1	..	..	5 1	3	1.9
Rajpore 1	...	..	4 7½	2	7.2
" 2	...	..	3 8	2	7.8
Picked Jubblepore	..	...	5 9	3	11.7
Jubblepore 1	..	...	5 5	2	11.6
" 2	..	..	4 1	2	11.8
Vingorlas 1	...	...	4 7½	2	11
Fair Coast Madras	..	..	4 0	2	8.5

Summarising their results, the authors show that "apart from price, Bhimley myrobalans come first for their acid developing power, while Jubblepore and Vingorlas yield the most bloom

Bhimleys also produce the best coloured leather, and taken as a class, show the highest percentage of tanning matter. In order to compare the result of tanning determination with the average price for each variety, we have calculated the cost of one per cent. of tanning per ton, and in the above table it can be seen that the most expensive variety costs 4s. 3½d. per cent. per ton, the cheapest working out at 2s. 2 6d."

In view of these figures we may turn to the present Calcutta market rates of myrobalans and find that the price of No. 1 picked is Rs. 2-8; No. 1 ordinary Rs. 2-2; No. 2 Rs. 1-6 to Rs. 1-5; and No. 3 Re. 1 to Re. 1-2 per Bengal maund, loose. The average value of the whole of the Indian export is Rs. 3-8 per cwt., so that there is a fair margin of profit left for the merchants before the *harras* of the Indian jungles are deposited in the tanyards of Europe—*Capital*.

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GERMANY vs. AMERICA IN FORESTRY METHODS. The United States Government will participate in a competitive exhibit at the World's Fair in St. Louis, having for its rival the German Empire. Which nation's methods of forest management are best and most practical is the problem to be solved by actual demonstration. Two tracts of land, already partially covered with trees, and each about five acres in extent, have been assigned to the United States and German Governments, as the laboratory for their tests. The two lie side by side, so that the visitor may walk through what the Americans call the "arboretum" and observe all American methods of forestry, and then step across into what the German designates as a "forest garden" and learn the German method. No trees will be cut from either tract, rather transplanting will be resorted to, and when the Exposition opens miniature forests may be seen. Every tree that thrives in the latitude of St. Louis will be represented, and the specimen can be easily designated. Attached to each tree will be an aluminum label on which will be stamped the botanical and common names. Each display will embrace practically the same number of trees, and they will be of practically the same varieties.

The exhibits will be in charge of the most expert foresters to be found in the two countries. Interest will not centre in the exhibits merely because they represent all that is best in the forestry of both countries, but because of the practical demonstration and tests that will be made every day of the Exposition. Trees will be transplanted, and the most approved apparatus for this work will be shown in actual operation. Trees will be pruned and sprayed and all of the implements used will be a part of the exhibit.—*Indian Planting and Gardening*.

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FIRE AT YALE FOREST SCHOOL—At about 2. A. M., December 11th, Marsh Hall, in which the work of the Yale Forest School

is carried on, was seriously damaged by a fire which started in the basement and spread through practically all of the four stories, destroying the interior woodwork and furnishings and involving to a greater or less extent, the library, collections and other equipment.

The collections of South American woods and of Western Conifers were totally destroyed, as was also a large part of the tools and forest implements.

The large collection of domestic woods was badly smoked, but otherwise uninjured.

The microscopes and other equipment of the Botanical Laboratory were slightly damaged. The valuable library fortunately escaped with little injury.

One of the heaviest losses was in the Technological Laboratory, where nearly the entire data for six months' work by an expert and two assistants was destroyed with the apparatus. This was co-operative work with the Bureau of Forestry, a study of moisture and volatile oil in relation to strength of timber.

A large force of men is at work reconstructing the interior of the building, which can now be adopted closely to the various needs of the school. It is expected that all classes will be resumed without interruption at the opening of the term on January 9th.

An idea of the loss may be gained from the fact that the insurance allowed by the underwriters is 17,000 dollars.—*Forestry and Irrigation.*

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**TIMBER FOR INDIAN RAILWAY SLEEPERS.**—A correspondent writes to the *Madras Mail*:—The difficulties of securing efficient Indian timbers for sleeper supplies, as any one connected with railways in India knows, have up till recently assumed acute proportions. Many of the forests were so rapidly denuded as to make it evident that before long, unless something happened, railways in particular would find themselves very awkwardly placed for timber. Recently, however, Australian Jarrah wood appears to have filled the gaps necessary to give some of our forests breathing room. This wood has now been in use on some of our railways for over seven years, and the excellent condition of the sleepers, particularly those laid on the East Coast Railway seven years ago, lead to the belief that the wood is going to be a very valuable one for India. That it will have the same life here as in Australia, viz. 30 years, is very doubtful, and can only be proved by time. For the present, however, it is satisfactory to have at hand a cheap timber that serves for many purposes at a reasonable price as an excellent substitute for teak. The principal company supplying India with this Australian timber is of purely British proprietorship, with Sir Ernest Paget, Bart., Chairman of the Midland Railway, as Chairman of the Board of Directors in London.

THE introduction of Indian teak (*Tectona grandis*) into the territory of the British East African Protectorate is to be attempted; and large quantities of seed from this country have been sent to the Forest authorities there for experimental cultivation. It is believed that climate and soil are favourable for the experiment, which ought to be of considerable economic and commercial importance if it turns out successful.—*Pioneer*.

THE LATEST IN TREE FELLING.—Two new methods of tree felling are announced, and it is claimed for each that it makes the woodman's axe a thing of the past. The first invention is a pneumatic saw, which is said to cut its way through the stoutest of trees in a very few minutes. One of these machines recently exhibited in New York weighed less than half a cwt., yet was said to be capable of felling 150 trees a day, each tree being 3ft. to 4ft. in diameter. The saws, says the *Citizen*, are driven at a high rate of speed by air pressure, the tubing which conveys the air from the compressor being made of any length required, so that the machine may be sufficiently distant from the saws to prevent accident when the tree falls. The second method consists in substituting for the ordinary saw a platinum wire, electrically heated. The wire cuts through the tree very quickly, and, of course, produces no sawdust.—*Timber Trades Journal*.

[The substitution of an electrically heated platinum wire for the saw blade does not appear to be a new invention, as we find in the review of the Report of the Proceedings of the Forest Conference of 1875, published in Vol. 3 of the *Indian Forester*, that Mr. Fernandez alluded at the Conference to a similar invention.—HON. ED.]

## VII.—TIMBER AND PRODUCE TRADE.

### Churchill and Sim's Wood Circular.

2nd February 1904.

ROSEWOOD—EAST INDIA.—There is a steady demand for good wood of fair sizes, but only low prices are obtainable for inferior logs

SATINWOOD.—EAST INDIA.—Sales are small as stocks are held above buyer's views.

EBONY.—EAST INDIA—is not really sold.

### PRICE CURRENT.

Indian teak, logs, per load	...	£9-15s. to £18
„ „ planks „ ...	...	£12-5s. to £20
Rosewood, per ton	...	£7 to £12
Satinwood, per s.ft.	...	7d. to 18d
Ebony, per ton	...	£6 to £10

### Denny, Mott and Dickson, Limited.

WOOD MARKET REPORT.

2nd February 1904.

TEAK.—The landings in the docks in London during January consisted of 350 loads of logs and 533 loads of planks and



scantlings, or a total of 883 loads, as against 335 loads for the corresponding month of last year. The deliveries into consumption were 398 loads of logs and 392 loads of planks and scantlings—together 790 loads as against 559 loads for January 1903.

The Dock stocks at date analyse as follows:—

	6,904 loads of logs, as against 5,165 loads at the same date last year.				
4,055	„ planks, „	2,711	„	„	„
—	„ blocks, „	—	„	„	„
Total	10,959 loads	„	7,876 loads	„	„

The market has developed no fresh feature. The result of the tenders for this year's requirement of H.M. Admiralty is not yet known—owing to a delay caused by the original quantity of 3,370 loads having been increased by some 500 loads. Rolling stock requirements have been unimportant; and, although there has been a fair demand for logs for shipbuilding, London stocks have not been decreased thereby. The demand for planks and conversions for general purposes continues to fall away.

Business during January has been marked by an increasing anxiety to decrease stocks in face of the continued restriction in the demand for consumption. Nevertheless, there have been indications that consumers have many requirements, which they have delayed covering in the hope of a general fall in prices; and it is quite possible that such held-back orders will come on the market in sufficient quantity to give a very appreciable fillip to the demand during the next few weeks.

### Market Rates for Products.

*Tropical Agriculturist, 1st February, 1904.*

Cardamoms	...	... per lh.	1s. 6d. to 1s. 7d.
Croton seeds	...	... „ cwt.	15s. to 22s. 6d.
Cutch	...	... „ „	22s. to 30s.
Gum Arabic	...	... „ „	15s. to 20s.
Do. Kino	...	... „ lb.	4d. to 6d.
India-rubber, Assam	...	... „ „	2s. 3d to 3s. 3d.
Do. Burma	...	... „ „	2s. to 3s. 3d.
Myrabolams, Madras	...	... „ cwt.	5s. 6d. nom.
Do. Bombay	...	... „ „	4s. to 8s.
Do. Jubbulpore	...	... „ „	4s. to 5s. 6d.
Do. Bengal	...	... „ „	2s. 9d. to 4s. 10d.
Nux Vomica	...	... „ „	7s. to 10s.
Oil, Lemon grass	...	... „ lb.	7d.
Orchella weed, Ceylon	...	... „ cwt.	10s. to 12s. 6d.
Seedlac	...	... „ „	180s. to 210s.
Tamarinds, Calcutta	...	... „ „	8s. to 12s.
Do. Madras	...	... „ „	4s. 6d. to 6s.





EUGENIA OCCIDENTALIS, BOURDILLON

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## ***Eugenia occidentalis*—a new Species communicated**

BY J. F. BOURDILLON, F. L. S.

### **MYRTACEÆ.**

#### ***Eugenia occidentalis*, sp. nov.**

Leaves 5—7 in. by  $\frac{1}{2}$ — $\frac{3}{4}$  in. opposite, entire, linear-lanceolate, tapering to both ends, thinly coriaceous, venation indistinct. Petiole stout,  $\frac{1}{4}$  in. Flowers white, 2 in. across, in terminal and lateral cymes, on long pedicels, calyx-tube white  $\frac{3}{4}$ — $1\frac{1}{4}$  in. long, funnel-shaped, lobes 4, ovate-oblong, petals 4 white on a broad claw, stamens white, very numerous and very thin,  $1\frac{1}{2}$ —2 in. long, style long and thin. Fruit not seen.

A small tree only found hitherto in the forests on the banks of the Periyaur River in North Travancore. Flowers January—April.

In the Kew Herbarium there is a specimen collected by Wight and marked Cochin,—April 1849. In all probability it was obtained from the same locality as the specimen figured. [See Brandis' "Indian Trees," page 319.]

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## **Strobilanthes and Natural Reproduction.**

BY B. B. OSMASTON, F. C. H.

One of the characteristic features of the undergrowth in the temperate or middle-hill forests in the Darjeeling Division is the dense thicket formed by a shrubby species of *strobilanthes* (*S. pectinatus*, T. And) which covers extensive areas to the exclusion of all other undergrowth, especially on Northern and Eastern aspects, under the mixed forest of oaks, chestnuts, magnolias, and laurels.

This shrub flowers periodically, and then dies. This happened over the greater part of this Division in 1890, and again in 1902, showing that the life of a generation is 12 years.

Like most of its congeners it yields a good fodder, and the dry stems burn well, and are collected on a large scale by the poorer inhabitants a year after the death of the plant.

It usually attains a height of about 10 feet with a girth of 9 inches, though larger individuals may often be seen, and I have a specimen 15 inches in girth.

It affords an exceedingly dense shade, in spite of which seedlings of most of the more valuable timber trees are able to persist beneath it, and having done so until the periodic seeding they get a chance of keeping their heads above the new generation of the strobilanth.

The weak point in the regeneration of the forest, however, shows itself the year after the death of the strobilanth, for at this stage the cattle (and most of the forests in question are subject to grazing) find their favourite fodder gone, with the natural result that they turn their attention to the few tree seedlings which may happen to be on the ground, and devour them.

The remedy which at once suggests itself is to close the forest to grazing for a couple of years or so after the seeding of the strobilanth, but unfortunately this is at present impracticable. An experiment was made in 1902, which consisted in cutting the strobilanth over an area of 6 acres in the month of June, when it had commenced to flower.

The experiment proved successful, and the strobilanth was practically exterminated on the area treated. It is, however, I think, doubtful whether much would be gained by the wholesale extermination of this plant for the reasons explained above.

Another shrubby species of this genus (*S. Helictus*) which is also gregarious, but of less importance owing to its comparative rarity, also flowered and died in 1902.

I can find no record of any previous flowering of this species, and consequently its "period" is not known.

It is a very handsome shrub with its zig-zag spikes of pure white flowers.

While on the subject of *strobilanthes* it may not be out of place to recall the fact that *S. wallichii*, which is such a pest in the karshu oak and fir forests of the Jaunsar Division of the School Circle, flowered and died in 1894 (I had the good fortune to be a witness of this, and a finer sight than the blaze of purple blossoms I have rarely seen). The "period" of this species being also 12 years, it follows that it will again flower in 1906, and it will be in the summer of that year that any steps to exterminate it might most profitably be undertaken. Should a campaign against this species be decided upon, I would suggest that the leafy branchlets (which alone bear flowers) should be sickled off in July or August over the areas taken in hand. This could be cheaply and rapidly done at a cost, I should say, not exceeding 8 annas per acre.

### Flowering of *Bambusa Polymorpha*.

BY TAW KWE.

In spite of the sure signs seen by a late Conservator in Burma, this flowering has been somewhat delayed, and we are still waiting and writing. However, I suppose the flowering will come in

due course, and the writing may then cease, and then we shall see a first-class blaze of the *Kyathaung* Forests (it is too much to hope that the fires will go too), as I do not believe it will be possible to keep fire out of such forests. It is true I have only experience of one *Kyathaungwa* Division,—*Pyinmana*, but I shall be most astonished if any of that escapes except the *Indaing* and *evergreen*. When the *Kyathaung* flowers there, those reserves are honeycombed with villages and foot-paths; each path will be blocked with fallen stems, and the Burman will want the paths cleared, and, what's more, he will see they are.

Now I see Kwe-tu-wet-u has been writing that we shall have to make our fire lines more elaborate, that means we shall spend more money, harass some Divisional Officers more than usual, but with the same sure result, *i.e.*, the clean sweep of the area by fire, and a jolly good thing too, for good-bye to any teak reproduction of any sort in any forest in which at least 75 per cent of the bamboo seed is not destroyed by fire, for in unburnt forests the young bamboos will be so thick that a bison will be hardly able to force his way through, let alone a teak seedling; and moreover, if the fire does not sweep through the first year, it will the second, with a bigger blaze, only not so beneficial, as the young bamboos will then be up.

Do any of your correspondents realise that the teak tree in Burma has come through many flowerings of the *Kyathaung*? And with remarkable success, too, to judge from what *Pyinmana* must have been like before it was an organised British Forest Division, therefore why not copy what was a fairly successful treatment? adding what we are sure will be beneficial, *i.e.*, when we have got rid of the shade of the bamboo which is the enemy, see that that shade does not get again half so dense in the future; and in my opinion that is the point. We don't want to eradicate the bamboo, for then we get "*kaing*," but what we want is fewer bamboo clumps, fewer *alagahbins* and more teak. Now to get this I would burn every forest where the bamboo has flowered and choose certain selected areas where teak is scarce or absent. I would sweep the bamboo seeds into heaps first, and then burn them more thoroughly than the rest; this will destroy a certain proportion of the jungle wood trees, and then in these areas, which should be as large as you have teak seeds sufficient for, dibble in teak seed in lines.

I may be an ass, my plan, however heterodox, is simple, it may be a poor thing but it is mine own, and I believe in it more than all the elaborate plans which I see mooted, and I pity the poor *Kyathaungwa* Divisional Officer who with an inadequate staff attempts to carry some of them out in his Division of 10,000 square miles.

**Fertility of Seed from Sal Coppice Shoots.**

BY C. E. C. FISCHER, DEPUTY CONSERVATOR OF FORESTS.

“ . . . . . No coppice poles to bring forth infertile seed from the borrowed vitality of the parent stool.”

“ It will, moreover, be found to be a general rule that seed formed from coppice shoots is infertile . . . . .”

These two statements will be found on pages 3 and 10, respectively, of the “ Notes on Sal Forest,” by Mr. Eardley-Wilmot, published as an appendix to the issue of the *Indian Forester* for June 1899.

It is with diffidence that I approach this subject, and my excuse is that it is one of very considerable importance when considering the treatment of sal forests, as the statements above forbid of sal being worked as pure coppice.

Does the verdict that seeds from coppice are infertile apply only to such shoots as are produced on a stump some distance above ground, and whose life is consequently concurrent with that of the old root stock, or does it include such coppice shoots as, springing from ground level, or even lower, are enabled to form their own root systems and eventually become detached and independent? In either case it would be satisfactory to know whether the opinion is formed from general observation only or based on specific experiment. From a small and perhaps not quite conclusive local experiment I am compelled to believe that seeds from sal coppice can be fertile in Ganjam.

The deduction from this experiment, even if reliable, I do not by any means thrust forward as a refutation of the infertility theory formed elsewhere. It is quite conceivable that, under the law of natural selection, sal here, in its southernmost limit, should produce fertile seed from coppice shoots, whereas in the centre of its habitat such seed should be infertile.

In the latter localities seedlings from coppice shoot seeds might originally have been weaker, and therefore less fitted for the fierce competition for existence, than seedlings from standard seeds, and this would tend to produce infertility. On the outskirts of its spread, however, reproduction frequently, no doubt, is mainly dependent on seeds from coppice shoots, and therefore their fertility would be fostered and fixed.

Moreover, it is well known that the quality of fertility is most delicate and is extremely liable to variation from change of climate and surrounding conditions, and there can be no question as to the very different conditions met with by sal in Ganjam and in Oudh or the Dun: for instance, there is no frost to be encountered here, the lowest temperature ever recorded, as far as I am aware, being 39° F. The above suggestions are, however, purely speculative.

As regards the local experiment already referred to, it was entered upon because of the references made to the statements that head this note.

Last May the four Rangers in the sal tracts of Ganjam (Gumsur taluq) made separate experimental sowings. Each officer collected and sowed in separate boxes or baskets seeds from standard trees and coppice poles. From 30 to 60 of each kind of seed were put down by each officer, and the earth provided was neither manured nor specially prepared, and was, in the main, inferior to the soil in a good sal forest where humus has been allowed to form.

The seeds were sown between May 25th and July 7th, and began germinating on an average for standard seeds in  $8\frac{1}{2}$  days and for coppice seeds in  $7\frac{1}{4}$  days. The total number of seeds sown was 170 of each kind; 48 per cent of the standard and 40 per cent of coppice seed germinated. There was no apparent difference in the vigour of the seedlings of either description.

The seeds were collected without reference to the soil the parent trees were growing in, and further experiments on a larger scale must be carried out separately for seeds from trees on the various descriptions of soils and sown in various soils.

It may be of interest here to note that the seedlings reflected in a small way in many cases the actual features of their growth in the forest, with regard to the annual checks they experience until the taproot has reached the permanent water level. In one case the box used contained earth to a depth of 4 inches, and the stems of all the larger seedlings were found to have died off when they reached a height of about 6 inches. This occurred when the taproot reached the bottom of the box, immediately above which the root was suddenly narrowed. On reaching the bottom the root was diverted at right angles and grew along the horizontal floor. In nearly every case fresh shoots had been formed on the stem below the dead portion and also one or two buds on the root a little below the collar.

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## II.—CORRESPONDENCE.

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### **A Fungus and some Indian Trees within German Forests.**

The *Indian Forester* of November 1903 had as appendix an excellent paper by Mr. B. T. Butler, Cryptogamic Botanist to the Government of India, on "A Deodar Disease in Jaunsar." The disease is due to the growth of the parasitic mycelium of a Polyporec, named by the well-known Professor Rob. Hartig *Trametes rapidiciperda*, lately renamed *Polyporus* or *Fomes annosus*. The most interesting statement in Mr. Butler's paper for the German forests, which, especially in the north, suffer much from the ravages of that fungus, is the discovery that the fungus possesses rhizomorphs, black strings, which convey the disease underground from plant to plant. According to R. Hartig's investigations the



spreading of the disease was limited to the infection by spores, and to those plants the roots of which were in actual contact with the roots of a diseased plant. There is now, after Butler's researches, no more doubt that the chief mode of propagation of the fungus lies in the rhizomorphs, not only in India but also in Europe, where the rhizomorphs were discovered by the writer of this letter in the experimental forest garden in Grafrath near Munich.

Laying out small paths in a young beech and oak forest I remember as early as 1902 to have met with thick, very tough strings, which I took to be rhizomorphs of *Agaricus melleus*, a parasite very common within the experimental garden. In 1903 quite a number of these rhizomorphs was collected, and on account of their extreme toughness used as a material to bind newly planted trees on poles. Mr. Butler's paper now settles the nature of these black strings as well as the biology of the Fomes fungus.

The rhizomorphs of the experimental garden were found in soil 20—30 cm. deep; in one case a rhizomorph was traced to 3 metres, where it broke with the same diameter it had at its beginning; the soil is still full of rhizomorphs, which must already be from 20—25 years old; the broad-leaved trees between the roots of which the rhizomorphs are now found are not affected by the fungus; therefore the rhizomorphs originate probably from the decaying stumps of the previous stand, which was composed of oak, beech and spruce. If they are still alive and vigorous enough to attack the roots of coniferous trees is not yet determined.

There is still a number of facts to investigate for the completion of the biology of this dangerous fungus, of which, before Mr. Butler's paper, nearly nothing was known but the development of the fungus *after* it had infected the plant.

It will be of interest to the readers of your journal to hear that several Indian trees are cultivated as forest trees at Grafrath since nearly 20 years.

In 1886 I had the opportunity of studying the forests of Northern India; most cordially received by Mr. B. Ribbentrop, then Inspector-General of Forests, by Messrs. W. R. Fisher (now in Coopers-hill), E. G. Chester, A. Smithies and Hearle. I enjoyed thoroughly the pleasure of investigating the Terai and the forests of the Eastern and Western Himalaya; from that trip I brought home as small seedlings one specimen of *Cedrus deodar*, one *Abies Pindrau* and one *Abies webbiana*, together with a quantity of seeds of *Deodar*, *Pindrau* and *Pinus excelsa*. *Deodar* suffers near Munich, on the high plateau between the Alps and the Danube from winter frost and principally from *Agaricus melleus*, which attacks the roots and kills the plants not unlike *P. annosus*. The protection against frost is effected by planting the *Excelsa* pine under the slight shade of the common oak, or by mixing it

with the American white pine (*Pinus strobus*) which in all localities exposed to frost acts as an excellent nurse for tender conifers; if deodar still fails under such conditions, the tree has to be disposed of entirely.

*Abies Pindrau* still alive and growing very well, being now 6 metres in height; grafted on native firs and standing amongst them, *Pindrau* never suffered by frost, notwithstanding that it had to brave—25° C. several times; *Abies webbiana* is continuously badly damaged by winter frosts; the growth of the Himalayan white pine, *Pinus excelsa*, is very thrifty; the greatest danger threatens from *Agaricus melleus*; besides that fungus the plant is damaged by heavy snowfall and severe winter frost. Of the Indian spruce (*Picea morinda*) there is very little to say; the seeds I brought in 1886 from India germinated into numerous plants, of which a few only are left. During my stay in Japan they were planted out in Grafrath in low ground, where they suffered badly from winter frosts; when I took charge of the experimental forests garden in Grafrath again, after seven years' absence, the remaining plants were removed into a higher elevation, with frosts less severe; nevertheless several plants were killed and those left are growing very slowly; there is no doubt that *morinda* has no value whatever for German forests.

*Tsuga dumosa*, the Indian hemlock fir, is growing very well, but seems to possess no quality which should make the tree preferable to the American hemlocks. Out of a number of seedlings of *Pinus gerardiana* one plant only is still alive, a low and poor representative of the interesting species; all efforts to procure seed of *Larix griffithii* have failed so far.

H. MAYR.

### On Certain Important Forest Questions.

It was with much regret and not a little indignation that I completed the reading of Mr. Gamble's letter on this subject in the November number of the "Forester." From the pen of a less eminent man many of the remarks might safely have been ignored, but Mr. Gamble's opinion carries far too much weight to allow the adoption of that simple course.

Mr. Gamble has earned the respect and admiration of every officer in the Department, but in the present instance I think he would have been better advised had he made a little more sure of his facts, before rushing into print with such sweeping and in a large measure undeserved, criticisms.

I know practically nothing of India, but I do claim some knowledge of Burma and the difficulties which confront the Forest Officer here. That we are making no progress I most emphatically deny, and I think that, when all the circumstances are taken into consideration, we are, on the whole, doing fairly well.

For myself I admit that, in many ways, we are very backward, but whether we could progress faster than we are doing must be a matter of opinion based on a knowledge of all the facts and conditions.

I propose to describe a few of these conditions and then to reply a little more in detail to some of Mr. Gamble's charges. In doing so I will be as brief as possible.

It must be remembered that divisions in Burma are of huge size, and, as administrative charges, very unwieldy. Also, that we have very little trained establishment, and that the untrained establishment is, with few exceptions, wholly unreliable and absolutely useless for works of improvement.

The Pinyinmana Division, of which I am at present in charge, is the one to which most of my remarks will refer, and as regards establishment and general conditions it is considerably above the average. Its area is, in round numbers, 7,000 square miles. There are 1,040 square miles of reserves as well as a large area of unclassified forest. There are five ranges, of which three contain 1,000 square miles of reserves—an average of 333 square miles per range—and all three contain considerable areas of unclassified forest in addition. The range officers are:—

Two 5th grade Rangers untrained.

One 6th grade Ranger (officiating only).

Two Deputy Rangers whose substantive appointments are in the 3rd grade—both untrained.

The average area of a Forest Guard's beat inside reserves is more than 50 square miles, and outside very much larger.

Regular Working Plans have been prepared for 1,030 square miles of the reserves, though all have not yet been sanctioned.

Omitting works that can be more or less carried out by the Range establishments, such as girdling in unclassified forests, repairs to demarcation, repairs to rest houses (we have 26 in the division, and build more yearly), making of plantations and weeding and tending of those already existing, fire protection (about 430 miles of fire lines), dibbling teak, climber cutting, marking of timber in course of extraction by lessees and contractors, etc., etc.; the plan of operations for the current year includes the following works which are based on the prescriptions (already in arrear) of such of the working plans as have yet come into force, and for which trained officers are necessary:—

- (a) Girdling of 7,541 teak trees in reserves.
- (b) Improvement fellings over 18,000 acres.
- (c) Making a road  $5\frac{1}{2}$  miles long, costing Rs. 18,500.
- (d) Selection and marking of 3,000 pyinkado trees for the departmental working of sleepers.
- (e) Aligning and preparing estimates for two roads aggregating about 15 miles.
- (f) Examination of forests for further reservation.

To cope with this there are three trained officers available, viz.:—The last joined Assistant Conservator (just arrived), a trained Dehra Dun Ranger, and myself.

It is scarcely necessary to say that the general control of a division like this does not leave the Divisional Officer much time to carry out personally any of these works; especially as in the present year he has to prepare a rough working plan for a forest 10 square miles and assist in the settlement of three proposed reserves. Add to this that during Improvement fellings over several thousand acres previously carried out in the division the area worked over per day averaged less than 30 acres, and it will not surprise any Forest Officer to hear that much of the work must remain undone.

Mr. Gamble's charge, I take it, is that we have made no progress, and that this is due to the apathy (or something worse) of Forest Officers in Burma. We can no more carry out improvements without the necessary trained establishment than the Israelites could make bricks without straw. When we can obtain the establishment we shall be able to carry out more improvements. Until then we have to do the best we can, however disheartening the process may be.

Now for a little more detail on some of the points mentioned by Mr. Gamble, who writes that he thinks he is right in saying that in Burma, at the present time, Forest management is too much subordinated to the production of revenue. Further on in the article the report of the French Consul at Rangoon is quoted, and the inference Mr. Gamble obviously intends to convey is that the teak forests are well on the way to be worked, out and that this is due to overworking sanctioned, if not actually carried out, by the Forest Department. Had Mr. Gamble said that the Forest Department in Burma is crippled by a policy which subordinates forest management to the production of revenue, I should have been less inclined to disagree with him. As it is I am not cognisant of all the circumstances governing the policy and not competent to form an opinion on that point. I may add that I don't think we should have much difficulty in respect of money for improvements if we had or could obtain the necessary establishment to carry them out.

The charge is a serious one, but I think not difficult to refute. Many of our forests have been overworked, especially in Upper Burma, but we can scarcely be held responsible for what happened before that country was annexed. The same is the case in India, and I never heard of any country in which forest conservancy was introduced before considerable damage had been done in this way.

For many years past a large proportion of the teak arriving in Rangoon has come from Upper Burma, and up to the end of 1900 this division probably supplied more than half that

quantity. A fair estimate of the average annual outturn from the Pyinmana Division would be 50,000 to 60,000 logs (in one year the number was more than 1,50,000), and the higher figure is probably more accurate than the lower. Counting from 1887 only, so as to allow for resumption of work after the war, this gives a total of 7,00,000 to 8,40,000 logs. Assuming two logs to a tree (the ordinary average for recent girdlings is 3 logs to 2 trees, but many of those extracted during the later years of the lease were short) we have 3,50,000 to 4,20,000 trees. I am sure it will both please and surprise Mr. Gamble to hear that very few trees indeed were girdled between the annexation and 1899, when girdlings under regular working plans were commenced. I doubt very much if the total number was 5,000. I joined the Department in Pyinmana in January 1892, and I know that since then only a few trees previously imperfectly girdled have been killed under authority. I know also that girdling was stopped in the early years after the annexation, because it was so obvious that there was far more dead timber available than was necessary to supply the requirements of the lease.

Thus, practically the whole of the enormous outturn resulted from windfalls, deaths from natural causes and (principally) from trees girdled before the forests came under control of the Forest Department. The lessees paid a very small royalty, and, naturally, towards the end of their lease, they extracted a great deal of inferior timber previously rejected. Considering all this it is not difficult to explain the decrease, &c., mentioned in the French Consul's report, and Mr. Gamble's fears that the Burma Forest Officer's energies are altogether devoted to ruining the forests under their charge are unfounded. We are proud of our forests and of the high revenue they produce, but we derive no direct benefit from it, and one can scarcely conceive that Mr. Gamble is serious in attributing to us actions and motives so childish and ignoble.

A large revenue is, in Burma at any rate, not incompatible with improvements, and our forests are far from being ruined. Mr. Gamble may rest assured that when girdling is carried out sylvicultural considerations are not ignored. The placing on the market of mature timber is just as important as any other of a forester's duties, and there are many mature and over-mature trees still available. In almost every compartment girdled over, trees 15, 16, 17, and even 18 feet in girth are obtained, and the figures are now available for the girdlings made during the first sub-period under the first Working Plan to come into operation. The average volume is 80 cubic feet per log, or about 4 tons per tree. This proves that we are not depleting our forests of small trees, and the fact that sanctioned Working Plans are in operation must be a guarantee that other considerations have not been lost sight of.

It is true that there is an enormous area of reserves for which working plans have not yet been prepared, but 'Rome was not built

in a day,' and the outturn of the eight sanctioned Working Plans parties may be expected to amount to about 1,000 square miles per annum.

It is also true that many of the most northerly teak forests have never been worked up to their full capacity, and some of them are still practically virgin. If the amount of teak now being extracted is comparatively small, it is because we are proceeding slowly and cautiously, and a considerable increase may be expected in the next few years. Indeed, it is more than probable that within the next ten or twenty years the amount available for export will be almost, if not quite, as large as it ever has been.

We are gradually working up to the highest yield our forests are capable of sustaining; and if we are proceeding too slowly, it is a fault on the right side. Though Mr. Gamble apparently doubts it, we are perfectly aware that it may take 150 to 200 years to replace a tree which can be cut down in a few minutes.

"The selection, demarcation and settlement of permanent reserves, a work which, elsewhere, is completed or nearly so, is still very much behindhand in Burma." If by this is meant that there is still a great deal to be done, it is perfectly correct, but it is rather unreasonable to compare a new country with an old one and the huge divisions and small establishments in Burma with provinces in which conditions are more favourable.

The areas of reserved forest in Burma were as follows:—

On 30th June	1901	17,836	spare miles.
Ditto	1902	18,606	do.
Ditto	1903	19,709	do.

The following are quotations from the Local Government Resolution on the Forest Administration Report for 1901-02, the latest available:—

"The area of reserved forests was increased during the year from 17,836 to 18,606 square miles \* \* \* \* . Reservation is being steadily pushed forward."

"The formation of new reserves is being closely followed by demarcation. The total length of additional work amounted to 1,217 miles, and 610 miles of boundary now await demarcation."

"Fire protection \* \* \* is in a backward condition, many officers expressing openly their disbelief in its utility."

This, of course, is a big question and one of the utmost importance to Burma. I propose to make a few general remarks on the subject; but I cannot see how this or any other doubtful question can be correctly decided unless Forest Officers *openly* express their opinions.

It is very noticeable that the strongest advocates of fire protection in the Burma teak forests are almost invariably men who do not know them or who have little or no practical experience of the effect on them of fire protection.

We want more facts and figures before we can prove definitely that fire protection is harmful, but no one can inspect and compare areas burnt every year with those in which protection has been successful for some years without doubting its utility in respect of teak, especially in the moister forests. It is no argument to say that because fire protection is beneficial in pure forests, it must necessarily be beneficial in mixed forests, in most of which one species only is saleable, and that one with considerable fire-resisting powers, nor that because it benefits most species, it must necessarily benefit all. Ignoring other considerations for the moment, if fire protection is beneficial, why is it that teak grows faster in unprotected than in protected forests? Measurements of marked trees made yearly during the last 12 years in this Division show this; but the number of trees measured is too small for the experiment to be considered conclusive. A reference to page 529 of the latest edition of Mr. Gamble's 'Manual of Indian Timbers' will, however, confirm the result indicated by the measurements.

The opinion that fire protection is harmful in our teak forests is steadily growing. There is of course a great deal to be said in its favour; but as we usually commence our service, convinced of its value, the change of opinion with increased experience is significant.

It is claimed that fire protection has a very adverse effect on teak reproduction, and if this is so, the longer the protection lasts and the more successful it is, the more accentuated will that effect become, and the harder must be the struggle for teak seedlings that do appear.

In my opinion the operations most urgently required in the teak forests of Burma now are those known as Improvement Fellings; and forests in which these are carried out must be protected for a year or two before and for a few years afterwards. At the same time Improvement Fellings while greatly helping the existing stock cannot be depended on to assist reproduction or to lessen the struggle for existence of the future stock; and if it can be proved (which I don't doubt) that the effect of fire protection on reproduction is as disastrous as it is represented to be, no amount of damage by fire can justify protection. That, I imagine, is the position at present, and considering the importance of the matter, to say nothing of the vast sums we are now spending on fire protection, it seem advisable to lose no time in obtaining further information either by the appointment of officers on special duty or otherwise. It is quite possible that we are actually damaging our teak forests by fire protecting them.

We are obeying orders and extending fire protection, but sufficient labour is increasingly difficult to obtain, and there is little probability of increasing the proportion successfully attempted. The operations require the constant attention of every subordinate who has anything to do with the protected areas (particularly of the ranger) during the whole of the working season,

and other matters have as a natural consequence to be neglected. Of 5,412 square miles attempted in 1901-02, 4,979 were successful; but results in 1902-03 were much worse. I have not yet seen the figures, but if we are to protect, further extension should depend on the successful protection of areas already attempted.

I have already written at far greater length than I originally intended, but I cannot conclude without a few more remarks.

The necessity for sending officers to Burma to qualify for promotion must be a matter of opinion, but there can be no doubt that conditions here differ greatly from those in India, and Mr. Gamble has made no allowance for this. Most of us have suffered considerably in recent years owing to a number of senior officers having been transferred from India. This may or may not be unavoidable, but its effect on promotion is decidedly unpleasant for Burma men, who already lack many comforts and advantages enjoyed by their confrères in India.

We admit that in many respects Burma is backward, but the reasons given or inferred by Mr. Gamble are as absurd as they are untrue. He finds fault with Sir Dietrich Brandis for 'careless writing,' but his own letter shows little evidence of care in ascertaining the true state of affairs in Burma; and, as he himself tells us, careless writing is only harmful and dangerous.

Fair criticism cannot reasonably be objected to. Mr. Gamble's criticisms are by no means fair; and we shall be much more grateful to him if he will tell us where the additional trained assistance we undoubtedly require is to come from and how it is to be obtained.

S. CARR.

### **Fire Protection in the Teak Forests of Lower Burma.**

"The Indian Forester" for December contains an able article by Mr. H. C. Walker, for which I for one beg to thank him. Still I cannot help smiling at the calm assurance, or ingenuous brass, with which he proceeds to lecture me on "caution." It is just because I am extremely cautious in matters scientific that I refused to swallow whole his indiscriminate advocacy of fires in forests. I characterised his cocksureness on debatable points as "pernicious," not because I am myself cocksure that he is wrong, but because his thesis has yet to be proved, and because it was stated in a manner only too likely to afford the ignorant a chance of dividing our house against itself. There is a charming amount of assurance, too, about his claim to be the old established orthodox church, the policy of fire protection to be the new-fangled heresy. He should surely know that all the world over (except perhaps by the Burmese) fires are and have always been the recognised enemies and destroyers of forest. If therefore the case of Lower Burma is special (as it may well be) it behoves him not to preach caution to his seniors, but to explain very precisely and clearly the



conditions under which, and the localities in which, fires may be considered advantageous to forests. This he has not yet done, probably because he does not know and cannot imagine any Indian forests differing from those of Burma.

Mr. Walker has given cultural facts and arguments which I am willing to accept as in the main fairly correct for some locality and certain conditions somewhere in Lower Burma. But if he intends to imply that they are of general application, I put my pen through many of them, one after another. I cannot pretend to take his paragraphs *seriatim*, for it would fill the *Forester*, but the first thing that strikes my eye turning over the pages is the contention that fires do not cause hollowness in the subsequent coppice shoot because the taproot is discarded at an early date, and with it the few germs of decay disappear. This is a question of fact. I do not know whether he imagines that a plant can discard its roots as easily as a long suit in spades, but I imagine that, if he will take the trouble to dig out a lot of teak seedlings repeatedly cut back by fires and open them, he will not find one of them sound, while a teak seedling that has never been injured will be perfectly sound.

There is no such thing as a "prejudice" in favour of fire protection. It is admitted and proved up to the hilt that fires are ruinous to forests in America, Africa, Australia and India, besides Europe. Mr. Walker might walk from Bombay to Surat and Khandesh without finding a single sound teak seedling, and very few young teak seedlings of any kind. The forests are burnt every year, sometimes twice. I therefore beg Mr. Walker to give us a little less lecture about "caution" and pharisaical attitudes and more precise details to justify the exceptional position he adopts. Details of climate, soil, rainfall, situation, composition and constitution of the forests referred to, and so forth, and he may rest assured that other foresters are quite as anxious as he is to attain true knowledge.

MAURITIUS: 18th February 1904.

F. GLEADOW.

### The Term "Congeners."

The following is perhaps of very small importance, but it is as well to be accurate, and I should like to point out the misuse of the word "congener," which has recently been misapplied at least on two occasions in *The Indian Forester*.

In my dictionary (Chambers's) "congener" is explained as . . . "of the same kind or nature," and in Mr. Heinig's 'Glossary of Botanic Terms' as "species nearly allied in all essential characters."

In face of these explanations I do not think that it can be correct to refer to *Albizzia amara* and *Santalum album* as "congeners." "Associates" seems to fully convey the intended meaning.

C. FISCHER,  
Deputy Conservator of Forests.

### A Jest ?

Can any one tell me what is the meaning, if it has any, of the following remark made by Mr. Hauxwell on page 121 of the March number of *The Indian Forester* ?

"We are not yet reduced, as in India, to raising an annual revenue of Rs. 27 on dead teak leaves which has to be collected in instalments."

Is it a jest ?

C. C. HATT,  
*Deputy Conservator of Forests.*

### III.—OFFICIAL PAPERS AND INTELLIGENCE.

#### Prize Day at the Imperial Forest School, Dehra Dun.

THE annual prize-giving took place on the 26th March. The Board of Control, who met to take part in the final examinations at the close of the School course, and to deliberate on the management of the School, consisted this year of the following officers:—

Mr. E. G. Chester, Conservator of the Punjab; Mr. H. Slade, Conservator of Forests, Burma; Mr. G. P. Millett, Officiating Conservator, Bombay. The Inspector-General of Forests to the Government of India presided, and Mr. M. Hill, Assistant Inspector-General of Forests, acted as Secretary. The prize-giving took place at 3 o'clock of the afternoon in the Central Lecture Hall of the School.

The Director of the School, Mr. A. G. Hobart-Hampden, spoke as follows . -

"MR. EARDLEY-WILMOT, LADIES AND GENTLEMEN,—With your permission I will now read the School Report. The year may be termed a normal one; the class which is leaving us has not been as brilliant as that which left last year, but that class was quite exceptional, and the present year's class is, I think, a fairly average one: there have been some honours and a few failures. The Staff of the School has during the past year lost Mr. B. O. Coventry, who has taken long furlough. His sympathetic treatment of the students was, I am sure, much appreciated. His place was ably taken by Mr. Hole from the Central Provinces. Systematic Botany was taught during the hill tour by Rai Sahab Upendranath Kanjilal, Mr. Duthie having now retired. I had hoped that Dr. Leather would have been able to take the lectures in Chemistry, Physics and Soils, but he was unfortunately prostrated by illness. I am very glad to see him again sound and well. Lala Ruchi Ram from the College at Lahore took these lectures, and Mr. Peal, from the Indian Museum, took those in Zoology, in place of Mr. Stebbing, who was officiating as Superintendent of the Indian Museum. Dr. Leather and Dr. Butler have helped us in the final examination, and I am very much obliged to them.

"I very cordially acknowledge the excellent work of the Deputy Director and Officers of the School Staff in connection with both the Upper and Lower Classes. Coming new to the School I have been struck by the sympathetic relation of officers with their students, while at the same time full discipline has been maintained. Our students have, taken as a whole, been very well behaved, and have given me very little cause for complaint in this connection.

"The physical side of our training is one which gives us much concern. In the matter of games we are at somewhat of a disadvantage as compared with other Colleges, because it is only during the rains that any sort of regularity can be had, and even then, since Dehra has nearly 100 inches of rainfall, we are a good deal hampered. Nevertheless hockey, football and tennis have been patronised, and in hockey certainly I know a good deal of energy has been displayed. I would strongly impress all students the advisability of going in thoroughly for manly games, instead of loafing idly about and doing nothing.

"The sports, too, went off very well. I may mention Daulat Singh and Turner as specially successful, and several others did well, but there is no time to give all their names. But though we labour under some disadvantages in games, the extended tours our students make through the forests supply, in my opinion, a most excellent physical training. I am authorised by a Conservator from Bombay on the present Board of Control to say that he has been much struck by the improvement in appearance of students, who came up last April from his Circle, and their well set-up appearance. This is also due no doubt to the energetic work of the drill havildars, so kindly lent us by the Colonel of the 2nd P. W. O. Gurkhas.

"We have been lucky in the matter of health. There were two small accidents, which fortunately left no evil results, and one other student among the juniors fell ill and had to fall back a year, but rejoins in a few days. To Major Fischer, the Civil Surgeon, and Babu Mehtab Singh, the Hospital Assistant, our thanks for their care are due.

"During the past year the Government of India have sanctioned in principle the construction of an official residence for the Deputy Director and a much-needed extension of the Museum."

"The tours extended this year into the Central Circle, as well as Oudh, but the usual tour to Changa Manga was not possible by reason of plague."

"When the class which is now leaving us first joined they were 46 strong, and two joined later. Seven of these have gone, but two of the seven have only gone down to the juniors. Of those still here 29 Upper Class and 9 Lower Class obtain their certificates to-day, while three Upper Class students have unfortunately failed. One Upper Class student and two Lower

Class students have won honours. No medals have been awarded. Thirty-eight juniors (including two who came from the previous year) joined last April, of whom 34 now remain. In April I expect 54 new students. Sixty-one out of 109 examined (besides several others who failed in English) qualified.

"I will now read the list of prizes and the names of those who have obtained certificates:—

(1) The Hon'ble Member in the Revenue and Agriculture Department has every kindly instituted a prize to be called the Hon'ble Member's Prize, and to be given to that outgoing student who is likely to make the best Forest Officer. This has been awarded to Premnath.

(2) The Inspector-General of Forests' prize for the best all-round athlete goes to Daulat Ram.

The prizes kindly given by the Members of the Board of Control are the following:—

(3) Mr. Chester's prize for the best student in the Upper Class: This has been won by Mohamed Maula Bux.

(4) Mr. Slade's prize for Forestry—Mohamed Maula Bux.

(5) Mr. Millett's prize for Forest Engineering—Mohamed Hayat.

(6) The prize offered by Mr. Hill, Assistant Inspector-General of Forests, for the best Lower Class student goes to Bahadur Singh.

(7) The Director's prize for Botany—Atulananda Das.

(8) The William Prothero Thomas prize, for the best student in Practical Forestry, goes to Premnath.

(9) The Campbell Walker prize for the best Madras student in Forestry—Deva Dasan.

The order in which the certificates have been obtained was then read. In the Upper Class honours were obtained by Mohamed Maula Bux, B.A., and in the Lower Class by Bahadur Singh and Hanumant Jageshwar.

The Brandis prize of Rs.100 was awarded to Mr. M. Rama Rao, Extra Assistant Conservator of Forests, Madras, for his article on 'Root Parasitism of the Sandal.'

Mr. Eardley-Wilmot then spoke as follows:—

"Whenever I come to Dehra, I am impressed with the liberality of the Government of India towards our Forest students. They are provided with free education, and in many cases also are paid full salaries during the time they are being educated. We select for the teaching staff throughout India those gentlemen, both English and Indian, who have special qualifications for the work. All that we exact in return is diligence and good conduct during the school course, and that at its close the students should satisfy the examiners that they have profitted by the care and trouble bestowed upon them. No one will deny that these are very handsome terms. But it seems that there are various ways of passing the final examinations. Some do so with honours some

with credit; some just manage to scrape through; and some require a helping hand in the way of grace marks. The marks this year are not high; we have three honours men instead of the six of last year, and these results in my opinion show a want of receptive power in some of the outgoing students. Unless this is remedied in the future, the professional advancement of these students may suffer considerably.

"I do not propose to congratulate the students on passing the examinations. I think that with the advantages offered all should pass with higher marks. But I would point out that the lower the receptive power of the class, the greater has been the strain on the teaching staff: and, speaking for the Board of Control, I wish to congratulate that staff on the results of the examinations, and to thank the examiners for the infinite care and patience with which the knowledge of the students has been extracted. I am sure the students will all their service be grateful both to instructors and examiners.

"We can now give away these prizes. Their number and value certify to the interest taken in the students, not only by officers in the Department, but also by others in a high position in the Government of India. The names of the prize-winners will in future be recorded in the School Calendar, and this should result in even a keener competition for the honours we are now going to confer."

The prizes were then given away by Mrs. Eardley-Wilmot, after which the Inspector-General handed the School certificates to the successful students.—*Pioneer*.

### R. S. F. Fagan.

A correspondent in Bombay writes as follows:—"I heard with regret of the death at Brighton on December 21st last of Mr. R. S. F. Fagan, Conservator of Forests, Bombay, thus adding another to the sad list of casualties which have occurred recently in the upper ranks of the Forest Department. Mr. Fagan came of an old Indian family and was born in India, whence he went to England at the age of four years old on the outbreak of the Mutiny. His father was killed at the Siege of Delhi. He was trained at Nancy, and came to Bombay to join the Forest Service of that Province in 1877, being appointed shortly afterwards to the Ahmednagar Division. Mr. Fagan served there for a number of years, and was known as a smart and energetic officer. He subsequently held successively the Satara and West Khandesh Divisions, and in both Divisions left behind him a record of good work ably performed. In the latter Division he was also able to indulge in his taste for shikar, and being a good shot, a considerable number of tigers and bears fell to his rifle. On the outbreak of the famine of 1899-1900 he was appointed on Famine Grass Operations on the G.I.P. Railway, S.E. section, with headquarters at Kurjut.

Great difficulties had to be surmounted by him, in common with other Forest Officers on similar work at other sections, in inducing people to bring in grass in sufficient quantities, in keeping the grass presses, which were always getting out of repair, at work, and in getting ties for the grass bales and afterwards railway trucks for the transport of the grass to the famine-stricken centres where it was required. The splendid nature of the work thus quietly and energetically performed by Mr. Fagan and the other Forest Officers was never fully comprehended by Government; and the arduous nature of the work and the *exposure* entailed by it seriously affected Mr. Fagan's health, which was at no time unfortunately very robust.

"Mr. Fagan's next appointment was to the charge of the North Kanara Division, but he left this Division in about twelve months to take up the duties of Conservator of Forests, N. C., towards the end of 1901. His good administrative abilities here had full scope as serious injury had been done to some of the forests in his circle by the successive years of drought, and energetic measures had to be undertaken to secure the speedy recovery of the forest growth. Unfortunately bad health still troubled him, and led to his transfer to the Southern Circle after eighteen months. This change was at first beneficial, and it was hoped that he would be able to continue for a long period in charge of this circle, in the work of which he took great interest, comprising as it does the management of the best teak forests in the Indian Peninsula. An illness in the latter part of the rains of 1903 culminated, however, in a complete breakdown in the middle of October, and on 31st October he left Bombay on a long period of furlough. Mr. Fagan reached England safely, and the accounts received of his health subsequently were cheering to his friends. Early in January, however, the sad news of his death under distressing circumstances in the previous December was received, and it became thus certain to his friends that his breakdown in health had been even more complete than had been understood at the time he left Bombay. By his untimely death the Bombay Forest Service has suffered the loss of a most capable officer."

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#### IV.—REVIEWS.

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### **Instruction in Forestry and Forest Economy in Germany.**

The training of her Forest Officers, and the question of Forest Economy generally, are now admitted to be matters of the most vital importance to the welfare of the British Empire, and a report recently prepared by Dr. Frederick Rose, British Consul at Stuttgart, under the above title, cannot fail to be of great interest to all of us.

It appears that the entrance conditions for all the German forest academies and institutes, without exception, agree in requiring the leaving certificate of a "Gymnasium," "Real Gymnasium" or "Upper Real School." The courses in these upper preparatory schools are arranged for a period of from 9—10 years. The number of hours per week devoted to study in the last and highest class is 32 at the Gymnasium, 37 at the Real Gymnasium, and 36 at the Upper Real School.

In addition to the subjects which are generally taught in the highest forms of our Public schools, we find the following among the obligatory subjects for the highest classes of these German schools, showing that a fairly extensive knowledge of them is, in Germany, considered essential for a sound preliminary education:—

*At the Gymnasium.*

Geography and Astronomy	...	...	1 hour weekly.
Mineralogy	...	...	2 hours "
Psychology and Logic	...	...	2 " "

*At the Real Gymnasium.*

Philosophy	...	...	1 hour weekly.
Mineralogy and Geology	...	...	2 hours "
Architectural Drawing	...	...	2 " "

*At the Upper Real School.*

Psychology and Logic	...	...	1 hour "
Mineralogy and Geognoey	...	...	2 hours "
Architectural Drawing	...	...	2 " "

In the upper class of the Upper Real School Greek is not taught and Latin is optional, while Physics (2 hours weekly), Chemistry (1 hour) and Freehand Drawing (3 hours) are all obligatory. In the upper class of the Real Gymnasium 5 hours are weekly allotted to Latin, and Greek is not taught, while English, Physics (3 hours) and Freehand Drawing (2 hours) are all obligatory. In the upper class of the Gymnasium 7 and 8 hours weekly are respectively devoted to Latin and Greek; English, Chemistry, and Physics are not taught, while Hebrew, Freehand and Perspective Drawing are optional.

At the present day the following schools of forestry exist in the German Empire:—

Description of Forestry School.	Name.	State.
Academy of Forestry	Tharandt	Saxony.
Ditto	Aschaffenburg	Bavaria.
Ditto	Eberswalde	Prussia.
Ditto	Münden	Prussia.
University Forestry Institute	Munich	Bavaria.
Ditto	Tübingen	Württemberg.
Ditto	Gießen	Hesse.
Technical University Forestry Course	Karlsruhe	Baden.

The conditions of examination for higher forestry officials in Prussia are as follows: Candidates having first shown that they are in possession of the necessary preliminary qualifications, *i.e.*,

that in addition to other matters they have obtained specially good marks in mathematics at their preparatory school and, that their age is under 22 years, are required to undergo a period of practical forestry work of at least one year, under the supervision of a higher forestry official. This is followed by a period of study of at least two years at a Forestry Academy or at a University Forestry Institute. Two examinations must then be passed. The application for admittance to the first examination must be sent in not later than six years after the period of practical forestry work. Having successfully passed this first examination the candidate is accorded the title of "Referendor," and is now required to undergo two further years of practical forestry work, during which time he must keep a careful daily record of the work performed. He may then enter his name for the second, or State examination, and on passing this he is promoted to the rank of "Assessor," and his name is placed on the list as eligible for an available position as Oberförster. Assessors, until they obtain such definite positions, are generally occupied by the State at a certain scale of daily remuneration.

In Baden the conditions are somewhat different. Candidates, after satisfying the entrance conditions, are admitted to the Forestry Department of the Karlsruhe Technical University, where they undergo a theoretical course of training for two years in mathematics, drawing and pure science. An examination has to be passed at the close of this preparatory course, after which a second theoretical course of  $1\frac{1}{2}$  years follows in forestry proper. The final examination must be then passed, and the successful candidate receives the title of "Praktikant." The latter must then serve a further period of two years' practical forestry work under the guidance of a higher forestry official. After this he is eligible for a position in the State forests, and receives the title of "Assessor."

The initial salary of the Oberförster ranges from £100 per annum in Baden to £186 per annum in Bavaria, and the final salary from £200 in Bavaria to £300 in Hesse. In Prussia and Hesse the highest salary is obtained after 21 years' service, whereas in Bavaria it is obtained in five years.

With these salaries it is instructive to compare those of the professional staff at the schools of forestry, of which Eberswalde may be taken as a good example. The Director at Eberswalde gets £415; fully qualified professors £205 to £345 with an annual sum for house rent.

The object of the Eberswalde Academy is threefold, and embraces (1) instruction in forestry, (2) the supervision of the forestry experimental stations in Prussia, and (3) the management of the Society of German Experimental Forestry Stations. In connection with Nos. (2) and (3) scientific publications are annually issued by the Academy, dealing with subjects of forest importance and setting forth the results of the research and



experimental forest work which has been carried out during the year. The publications for 1900 included, among several others, the following :—

(1) Editing the "Review of Forestry and the Chase" and of the annual publications on forestry and chase legislation and administration; (2) the results of the experiments made in the cultivation of foreign woods in the Prussian State forests; (3) critical comparison of the most important forest technical and forest police regulations of German and foreign forest administrations; (4) the representation of the interests of forestry in the Agricultural Chambers; (5) planting experiments with various trees.

The total number of students at Eberswalde is 62. The fees are as follows :—

Entrance fee ... ..	15 shillings.
Final examination ... ..	£2
Lectures and practical work ... ..	£3 15 0

The staff of the Academy is composed as follows :—

Description of staff.	Number.
Professor and scientific staff ... ..	13
Private lecturers and assistants ... ..	5
Various officials ... ..	2
Foresters and servants ... ..	9

The annual revenue of the Academy is £585, including £451 for lectures, and the annual expenditure £5,075, including £2,371 for salaries and allowances of professors, and £851 for salaries of lecturers and assistants.

The low scale of fees and the heavy expenditure renders State aid necessary, and an annual sum of £5,500 is allotted to Eberswalde by the State. In the year 1900, £4,000 of this sum was expended for purposes of instruction and £1,500 for experimental purposes.

The lack of anything in India approaching in character to the American Bureau of Forestry has already been pointed out in these columns. The establishment of Experimental Forestry stations in suitable localities throughout India, under the general supervision and management of the staff of the Imperial Forest School at Dehra Dun, which of course would be increased for the purpose, would give us what we so urgently require, and would be closely following the precedent set us by the country in which scientific forest management has reached its greatest perfection.

The entire area of the German Empire amounts to about 135,000,000 acres, of which about 126,000,000 are devoted to agriculture and forestry: Of this 126,000,000 acres, about 85,000,000 acres, or more than one quarter, consists of forests or forest land, and 32·4 per cent of the total forest area belongs to the State. Baden possesses the highest percentage of forests, viz., 40·9 per cent of its total area.

Details are given to show that in Würtemberg, which has 30·7 per cent of its total area under forest, forest land yields a net

annual profit of 14 shillings per acre, whereas the State lets land for agriculture at about £1-13-0 per acre. Based on the figures available for Württemberg, the probable annual revenue from forests of the German Empire is estimated at from £15,000,000 to £18,000,000.

It is pointed out that the prices realized for timber and fuel have steadily risen from 1886 to the present time, the price now realized for a cubic metre of timber being as a rule some 3 shillings higher than the price obtained in 1886.

In 1860 the annual profit per hectare of State forest land in Württemberg was 32 shillings. In 1901 this had risen to 54 shillings. Other States also have shown a similar steady annual increase. This is attributed chiefly to the spread and improvement of the facilities provided for scientific instruction in forestry, to the construction of better export roads, to the lowness of railway and canal freights, to better prices of forest produce, and to the continued cultivation of pine and fir, which now compose two-thirds of the German forests.

This most instructive report concludes with some interesting remarks on the general utility of forests, from which the following extracts are taken *verbatim* :—

“Although the example of the German Empire shows that it is possible to reap a substantial annual benefit from instruction in forestry and the consequent rational cultivation of forests, mere pecuniary gain is by no means the sole factor which ought to justify the solicitude displayed on their behalf by far-seeing governments, as there exist many other reasons, dictated by other motives and considerations, for the cultivation and preservation of forests. \* \* \*

The proximity of forests acts upon those who dwell in or near them in a similar manner as the proximity of the sea exercises a healthy influence upon those who dwell in or near the coasts, and it may be asserted that, to some extent, a country without forests resembles a country without a coast. \* \*

The inhabitants of the forests, the foresters, wood-cutters, and other forest workmen and dwellers are, as regards health, strength and a certain native shrewdness and sagacity, as superior to the peasants of the plain as these again are superior in health, strength and many sturdy virtues to the majority of the inhabitants of the towns \* \*

“From an æsthetic point of view forests are absolutely necessary \* \*

Finally, from a climatological and hygienic point of view the value of forests to a nation cannot be too highly estimated.”

The author closes with a reference to the great damage recently wrought in Switzerland by floods, and remarks that there is a growing tendency to favour afforestation, rather than expensive engineering works, as a means of preventing disastrous floods.

This report was presented to both Houses of Parliament by command of His Majesty the King in September 1903.

### The Genus *Diospyros* in Ceylon.

Mr. Herbert Wright, Superintendent of the Experimental Station, Ceylon, has issued a monograph on *The genus Diospyros in Ceylon—its Morphology, Anatomy and Toxonomy*. The monograph is appearing in two parts, the first of which has already been published. Part 2, containing specific descriptions and illustrations, will be issued shortly.

The genus *Diospyros* is the largest and most important of the *Ebenaceæ* and Mr. Wright has been at great pains to deal with his subject from every point of view.

In Part 1 the following arrangement has been adopted :—

- I.—History.
- II.—Distribution in Ceylon.
- III.—Vegetative Characters.
- IV.—Anatomy : Timber Properties, etc.
- V.—Seedlings.
- VI.—Reproductive Organs.
- VII.—Affinity.

Under history the whole of the literature on the genus is passed under review, the author commenting on the different views of previous writers on the subject from the time of Linnæus up to the present day.

Under distribution the author divides Ceylon into three zones—dry, wet, and intermediate. Seven species are found in the dry zone, thirteen in the wet zone, and in the intermediate zone, where the rainfall varies from 70 to 80 inches, all the dry zone species except *D. melanoxyton* are found in addition to a couple of the 13 wet-zone species.

The vegetative characters of the various species are fully described and compared, and the anatomy of the various tissues is dealt with at great length. In Ceylon the ebony of export is derived entirely from the genus *Diospyros*, and mostly from the species *D. ebenum*, although *D. melanoxyton* and also *Dalbergia Melanoxyton* both furnish a marketable ebony. The origin of the black heartwood of some members of the genus is discussed, and it is stated that the belief is common among Ceylon foresters that the proportion of heartwood is dependent to a great extent on the nature of the soil. The proportion appears greatest in trees growing on rocky hill sides and decreasing as the quality of the soil improves, analogous in a way to the sandal, in which the proportion of scented wood also decreases with an improvement in the nature of the soil.

The remaining sections are dealt with equally fully and clearly, and on the publication of Part 2, with its descriptions and illustrations, Ceylon will possess in compact form a really valuable monograph on the genus *Diospyros*. It is hoped that the author, Mr. H. Wright, will find time to do the same for other important genera in Ceylon.

**"The Indian Field" Shikar Book**

The above is the title of a small book just published by Mr. W. S. Burke, Editor and Proprietor of *The Indian Field*. It has been compiled with a view to enabling the sportsman to obtain without trouble or delay, reliable information about any one of the hundred and one points on which one may want information, either during a sporting trip or when one is making all the inevitable *bandobust* without which in these days no shooting trip can be successful.

All, or at any rate very nearly all, of the information it contains can be found elsewhere, but one's library when out on shikar has to be of the smallest, and in no other book that we know of is there to be found so much general information likely to be useful to the man out on shikar.

It contains a chapter on Big Game in which are given the Latin and vernacular names, habitat, description, habits, average size, record measurements, and other useful details. Similar details are given for small game and birds, while much attention has been given to the river, estuarial and tank sporting fish. The best seasons for fishing and the most likely tackle and bait have not been omitted.

Next will be found a chapter on Camp Equipment, on which the success and pleasure of a shooting trip so greatly depends. The author, however, rightly points out that it is beyond the scope of the book to enter at length into any review of the numerous matters embraced under Camp Equipment, and limits himself to dealing with the main things which are absolutely necessary for comfort and convenience.

To our mind the most useful chapter in the book is the one on Guns, Rifles and Ammunition. Here can be found, at a glance, the charges for most of the ordinary sporting rifles with details of their muzzle energy and striking velocity. Tables are given for reducing drachms to grains, and showing how many cartridges a given quantity of powder will load with grain and drachm loads. The number of pellets per oz of the various sizes of shot forms another table often useful to have at hand. The chapter also contains much other general information, some of which cannot fail to be very commonly useful.

The chapter on Routes to shooting grounds is in our opinion too condensed to be of much practical value, though the lists of *dak bungalows* may well come in handy during a shooting trip. Another chapter deals briefly with various "shikar wrinkles" in connection with various articles from boots to sandflies, while measures to be taken in case of snake-bite meet with considerable attention.

The Game Laws in force in the different parts of India are usefully introduced, and the book is made complete by game registers for big and small game as well as fish.

The book is wonderfully free from errors, but the vernacular name for the tiger in Southern India is *puli* not *kuli*. The kakur in Southern India is called *konda gori*, i.e., jungle sheep, and not *jungli bukri*. There is no *dak bungalow* at Dehra, and the list of *dak bungalows* might be more complete.

The book is tastefully got up, published by Thacker, Spink & Co., and costs only Rs. 5. It should be in every shikar camp in India.

## V.-SHIKAR AND TRAVEL.

### A Visit to Mauritius.

BY F. GLEADOW.

From the sea, Mauritius presents a striking picture of mountain and cliff, plateau and plain, rugged black vertical rocks with their heads often in the clouds, and their feet bathed in the sunny greenery of the sugar cane or the sombre tones of the forest. King of all in majesty, if not quite in height, towers Pieter Both or Booth, a precipitous mass ending in a shapely cone topped by an overhanging ball not unlike (to compare great things with small) a candle extinguisher. The mountain is called after a Dutch admiral who most injudiciously got drowned at its feet when going home on pension. (Still, we do not know what his wife was like—perhaps he was right.) Paul and Virginia surely knew it well; and a happy life they must have led, in days before malaria was introduced. When it arrived, it practically wiped out the coast population, for all who could possibly do so fled to the uplands, and the suburbs of Port Louis, formerly miles of country seats, are now left to the canes, the brambles, and the poor.

Immediately on arrival in harbour I was fetched off the ship by a steam launch specially sent by H. E. Sir Chas. Bruce, and taken to "Le Réduit." I had really come from Karachi and Bombay, but having joined this vessel at Colombo, was technically free of quarantine, while the unfortunates who had come all the way from Calcutta in her, had to stay all day to be squirted with disinfectants and otherwise amused by the gentle dalliance of the Sanitary Department. Among other pleasures they could watch the strings of dead horses floating out to sea, for the *surra* had killed most of the animals in the Colony. "Le Réduit" is the Hills Government House (there is another in Port Louis). Its name is derived from the fact that in the century before last it was intended as a refuge for Europeans in case of slave or pirate outbreaks.

In the launch sent for me was the Director of Forests and Gardens, Joseph Vaukeirshilck, an excellent botanist, a keen forester, and a man justly loved and respected by all. Though in the prime of life and vigour, an inscrutable Providence had already decreed that the casual stranger should outstay him. A few

months later he became ill, got better, was sitting up in a chair talking to me cheerfully one Saturday, and that evening was gone.

One of the first things that struck me was the slackness and absence of discipline in the place: policemen lolling against lampposts smoking cigarettes, railway guards and porters ditto. Neither police nor peons, nor military orderlies in undress think of rising or standing to attention when high officials pass them in public offices. Even civilians coming in to business by the morning trains, stroll gently to their offices as though it did not really matter whether they got there before lunch or after. But the worst managed thing I have ever seen is the Prisons Dept. The prisoners are supposed (well, I don't know if I even dare say *supposed*) to work some times. One meets gangs of them in the streets, the leading files swapping good stories with an individual of a very slightly higher type of nobility in front, possibly a warder, and ditto in rear—the whole cavalcade slouching at a pace that made my boots tingle to watch. A military slow march is a gymnastic step requiring some attention, but if you take the slowest approach to it that requires no attention, you have the Mauritius jail-birds' slouch. They do it deliberately, of set purpose, to show how much they care for the Government and the public. What they want is an Egyptian taskmaster behind them, to drive them to work, or mutiny, one or the other, and food or something more drastic accordingly.

The question of prisons naturally leads back to the Press, at any rate it ought to; or rather the Press (in part) ought to conduce, or be conducted, to the prisons. The Mauritius Press proper is everything that it ought to be or can be expected to be in so small a spot. But there is a gutter press which sticks at nothing, except honesty. Being the French type of gutter press, its standing dish is the inherent villainy of the Government and of all its high officers personally. With such a type of press, naturally every Government in France is more contemptible than the last. The French nation appears to like it, but it is a pity that such a press should exist in an English colony, because the surest way to *make* a contemptible Government is to abuse it until no respectable man will take a hand in it. Fortunately here the Government is British, and takes as much notice of the gutter press as it would of a bluebottle buzzing round a dungheap.

Here, in a bit of country forty miles by thirty, which ought to support two morning papers, and at the utmost two evening ones, there must be about twenty, including rags I would not use to clean my gun or my boots with. Like the miserable mangy curs that lie about the Port Louis streets, they must lead a wretched existence, but they don't die: that is the public misfortune. All Port Louis goes home by train every evening, and all Port Louis buys the poison because it wants something to read in the train; and there may be something spicy. If the local sales are

not quite enough to live on, it is always possible to blackmail public men who do not care to spend their time and money: shooting carrion.

Society in general is French, and a pleasant and amiable society it is. The English are commercially a minority, and the military are transitory, so that there is not quite as much fusion as is desirable. The resident English element frequents and inter-marries with the French freely, but the transitory element is afraid of its linguistic weaknesses, ignorant of its neighbours' virtues, in short insular. There are families with English names whose usual language is French, and families with French names which always talk English. The language of the unwashed is Creole, an elementary form of French deprived of gender, number and case, but complicated by the addition of incomprehensible negro terms derived from the slaves. Of later years the Indian, mostly from Calcutta or Madras, has pervaded the land; but those who settle here soon forget their classic tongue and take up the barbarous Creole.

The Indian also drops his caste to a great extent (when he has any), and what is worse *she* drops her clothing. I do not mean that she goes about like the ancient goddesses, with a star or crescent in her hair, but that she drops her graceful *sari* and puts on one or more ugly petticoats of Europe pattern. As she also becomes less particular in the ablution of self and clothes she is seldom attractive. Only the plain and moderately plain ones seem to come here. I have seen none of the lovely Aryan bronze or terra (scarcely) cotta maids the very sight of whom is enough to hurl the male reason headlong from its crumbling throne.

The Indian is the future master of Mauritius, and the Mauritians have only themselves to blame. They imported Indians to cultivate the soil, and allowed them to become proprietors thereof. A law forbidding the transfer of agricultural land in lots smaller than 50 or 100 acres would have settled the question.

Far from enacting such a law, certain landowners began by selling to Indians at high prices bits of land that they had no right to sell at all for cultivation; *viz.*, mountain reserves, which the law says are to remain forest for all time.

As the Indian was found to be a greedy buyer of inferior land at high prices in small lots, many estates sold to him all their most barren and inaccessible portions. The Indian for his own hand is a hard and steady worker, and he kept in cultivation for years lands where no Mauritian could exist. In other and more recent cases large areas of good land have been "*morcelé*," *i.e.*, sold by the acre or half acre to Indians and Creoles. Now half the mills in the island are closed and the crushing concentrated in the remainder, with the result that the Indian who had bought land with a mill within a possible distance now finds himself stranded on an exhausted soil, with double the distance to transport his canes, and not always able to sell them there.

The destruction of animals by *surra* has compelled the large owners to borrow capital and lay down a network of light railways all over their estates, but the Indians have been dragging their laden carts themselves, four to eight men to a cart, working not like "niggers" (for the "nigger" means the African who would rather steal than work any day) but like men. Thus the result so far has been the ruin of many Indian settlers who have abandoned the little fields they had purchased, and reverted to selling their labour. Nevertheless Indian ownership is spreading fast. The next stage will probably be the ownership of the soil by Indian peasants, and the ownership of the mills by Mauritian companies. The Indian will be squeezed, like his canes, until he finds some means of organising in defence. At present he has in some cases two mills competing for his canes, but the concentration of crushing into fewer hands is fast depriving him of this advantage. It is hard on the Indian, but perhaps good for the Colony, which possesses no great margin in the sugar market of the world.

The Creole (by which ambiguous word I here mean the African mixture) sometimes cultivates a small field, but the great body of this class have a horror of agriculture, derived from slave days partly, but also due to the general negro love of play and dislike of work. The Creole, like the British workman, loves to lounge round the drink shop, smoking, gossiping, and spitting all over the place. But he goes further. On his way home at dark he likes to pick up a fowl, a bunch of bananas, or anything else lying around on other people's property. Sometimes he does no work at all, unless it be to beat his wife if she does not work hard enough to keep him in comfort. He is a confirmed poacher, quite ready to shoot a keeper occasionally. He is physically strong and makes a bold coast fisherman given to the use of illegal meshes. As member of a crew he is neither smart nor orderly enough to be of great value. It is laid to his charge that his thievish propensities are responsible for the general absence of garden culture here (even potatoes come from Réunion) and for the almost ruined state of the vanilla industry. He has sometimes an excellent voice and sings with great expression and feeling. Altogether one is inclined to doubt whether the abolition of slavery was not a piece of sentimental hysteria. A "Protector of Slaves" could have put an end to the brutalities that were by no means characteristic of the system, just as effectually as our Protector of Immigrants now sees that the Indians are properly treated, housed, and fed.

(To be continued.)



**The Indian Pheasants and their Allies.**

BY F. FINN, B.A., F.Z.S.

(Continued from page 420.)

## CHAPTER IX.

## QUAILS.

## THE JAPANESE QUAIL.

*Coturnix japonica*, Blanford, Faun. Brit. Ind., Birds, Vol. IV., p. 116.

Native names :—*Udsura*, Japanese ; probably called *Ngon* in Burma.

This species much resembles the common grey quail, but both sexes of it have a richer chestnut tint on the flanks. This of itself would not be much to go by, but the male has the face and throat brick-red, without any trace of the dark markings found there even in the rare reddish throated variety of the common quail ; and the female is still more distinct, for although her throat is white like that of the hen of the ordinary quail, the feathers there are long and pointed instead of short and round, and the outer ones have rusty edges. The young males also possess these whiskers at first.

This quail inhabits Eastern Asia, Japan, and China. It comes at times within our limits on its winter migration, and no doubt often gets passed over as a common quail. When Mr. Oates wrote his excellent little work on the game-birds of India, two specimens were in the British Museum from our Empire ; both were hens, one coming from Bhutan and the other from Karennee. The latter had been procured by Major Wardlaw Ramsay in 1874. Dr. Blanford, writing on the same subject in the same year (1898) as Mr. Oates, stated that he did not consider these specimens characteristic, and thought it would be better to wait till a male was recorded before including the bird as Indian. Next year, however, Lieutenant H. H. Turner shot another of the species in the Manipur Valley, in February, and submitted it to me for identification with the rest of his Manipur birds. There was no doubt that this bird was a Japanese quail, as the pointed throat feathers were unmistakable, to say nothing of the richly coloured flanks ; the specimen is now in the British Museum. Lieutenant Turner states (*Journal Asiatic Society*, 1899, p. 244) that he saw a dozen or so of the birds, which were driven out by the firing of some long grass ; thinking they were only common quail, he did not trouble more about them. It would therefore be as well to examine carefully all supposed grey quails shot in Burma. The ordinary species is admittedly rare there, and very possibly this one takes its place. At the same time, intermediate specimens between the two species occur, so that it must be expected that some will turn up which cannot be fairly referred to either.

In its ordinary home this bird has the same habits as the common quail, and its eggs are similar; but the note of the male is different—a great argument for its specific distinctness. According to General Przevalsky, this note, which alone makes the bird easily distinguishable, consists of “some deep hollow sounds, several times repeated in quick succession.”

THE RAIN QUAIL OR BLACK-BREASTED QUAIL.

*Coturnix coronandelica*, Blanford, Faun. Brit. Ind., Birds, Vol. IV., p. 116.

Native names:—*Chota Butter*, Hind.; *Chanac*, Nepaul; *Kade*, Tamil; *Chinna Yellichi*, Telugu. For the most part, however, this species goes under the same names as the common quail.

This bird is very like the common quail, although a little smaller; but both sexes may be at once distinguished by the pinion quills being plain drab, without the pale cross-bars seen in the common species. Independently of this, the male can be distinguished by his brighter and purer colouring below. His throat-marking is pure white and jet-black, and his breast a decided warm buff, with splashes of black, which increase with age till there is a decided black patch in the middle. His bill is also often of a decided black.

This quail is resident or only partially migratory, and is not known outside our Empire. Within this, however, it is very widely distributed, although it has not yet been reported from Kashmir, Tenasserim, or the Shan States; but its resemblance to the common quail no doubt often causes it to be overlooked. It has much the same habits as its larger ally, affecting grass and cultivated ground, and shifts its ground locally according to the rains, whence its name. Thus to Northern Bengal, Oudh, Behar, the North-West Provinces, the Punjab, Sind, and the open parts of Upper Burma it arrives in the monsoon, apparently wishing to escape from unduly damp localities. In many parts of Central and Southern India the bird resides permanently.

It is found in pairs for about half the year, from April to October, and at other times singly. It nests in India from June to October, laying from four to nine eggs in a hollow on the ground, usually unlined. These eggs are a little smaller than those of the common quail, and are much speckled with dark markings; the ground-colour varies from yellowish white to rusty.

I may mention that the species has been recently bred in captivity in England by Mr. Seth-Smith, a Member of the Avicultural Society; this is interesting, as showing that this bird, naturally confined to a warm climate, can nevertheless, like so many such species, bear and propagate in a colder one.

The note of the male Rain Quail is quite different from that of the common quail, consisting of two notes only, like “whit-whit.” This difference in the notes of nearly allied birds is very interesting; it is not invariable, for among the ducks, for instance, our Indian resident, the spotted-billed duck (*Anas pœcilorhyncha*) has the

same note as the nearly allied migratory mallard (*A. boschas*), to say nothing of the representative species in Australia (*A. superciliosa*) and South Africa (*A. xanthorhyncha*).

THE BLUE-BREASTED OR PAINTED QUAIL.

*Excalfactoria chinensis*, Blandford, Faun. Brit. Ind., Birds, Vol. IV., p. 112.

Native names:—*Khair-butai*, *Kaneli* Nepaulese; *Gohal-butai*, Oudh; *Ngon*, Burmese; *Pandura-waturwa*, *Wenella-waturwa*, Cingalese. This exquisite little creature is the smallest member of the pheasant family found with us, and both sexes are easily distinguished from our other quails by their very small size and bright yellow legs. Above, both cock and hen are much like the common quail, with a similar intricate mixture of buff, brown, and black; below, they are very different, both from these and from each other. The cock has a slate-blue breast, the colour extending more or less on to the flanks, and a rich chestnut belly; the throat is boldly marked with black and white somewhat as in the Rain Quail. The hen has a buff face, and is buff below with more or less well defined black cross-bars. Cocks have red eyes, and hens and young cocks brown ones. The legs are, as above stated, bright yellow.

This bird is only about six inches long, with a wing of about half that length; it only weighs about two ounces.

Small and fragile though it looks, however, this tiny quail has a wide range in South-Eastern Asia, from India to China and Siam. It also possesses a hardy constitution, for, unlike most birds of its family, it seeks rather than avoids wet ground. Thus it is unknown in the dry regions of North-West India, and common in the moister districts of Bengal and Burma. Indeed, it migrates to some extent in search of damp situations, arriving in Lower Burma in May to be in time for the rains, though in Bengal it is commonest in the cold weather. Its haunts are in rank grass on wet land, and it is often found round paddy-fields. In India and Burma it breeds in June and July, but in Ceylon during the three months previous to these. At these times it is found in pairs, but at other times in coveys. The nest is in the usual hollow in the ground, grass-lined, and contains not more than half-a-dozen eggs, rather bigger than one would expect such a small bird to lay, being about an inch long. They are drab in colour, with more or less of a minute brown speckling. Not much else seems to be known about this little creature in the wild state, but its habits have been carefully studied of late years by certain good observers, members of the Avicultural Society, who have kept and bred it in confinement in England. It turns out to be a most interesting pet, hardy enough to bear our English winters in an outdoor aviary, and a free breeder if growing grass can be provided for it to nest in. The cock is a most attentive husband, calling his hen to take any tit-bit he may obtain, after the gallant fashion of the common fowl. He

occasionally utters a tiny crow, resembling a miniature imitation of the "brain fever-bird's" note. The hen is a prolific layer in captivity, and a good sitter and mother, and the chicks are easy to rear, and the most charming little creatures imaginable; they are literally not larger than the big black bees we are all so familiar with in India, and they can squeeze through half-inch mesh wire-netting! Although they take almost as long to hatch as common fowls, they mature with remarkable rapidity; Mr. Meade-Waldo, who was the first to breed them in England, found that his young cocks, when only just over a month old, had already assumed the proper plumage of their sex, and were actually crowing and calling their little sisters to feed! It is therefore very obvious that, though this minikin quail can hardly be regarded as game, it is pre-eminently suited for a pet; ordinary bird-seed keeps it well, with the addition of a few insects and egg for the young.

#### VI.—EXTRACTS, NOTES AND QUERIES.

##### **Our Forestry Problem.**

By DR. W. SCHLICH, C.I.E.

A year ago the President of the Board of Agriculture appointed a Committee to inquire into and report upon the present position and future prospects of forestry and the planting and management of woodlands in Great Britain, and to consider whether any measures might with advantage be taken, either by the provision of further educational facilities or otherwise, for their promotion and encouragement. Ireland was excluded from the reference in accordance with the expressed wish of the Irish Agricultural Department. One of the Assistant Secretaries to the Department was, however, nominated a member of the Committee, so that the authorities in Ireland might be in full possession of the views of the Committee for further action in that country.

The Committee has now submitted its report, and made various recommendations, which are under the consideration of the President of the Board of Agriculture. In the meantime every serious citizen should be made aware of the problem, and should awake to the necessity of early action being taken in the matter.

The questions which present themselves are chiefly the following:—

- (1) Why is the forestry problem of importance to Great Britain and Ireland?
- (2) What will be the result, not long hence, if nothing is done?
- (3) What is the present state of affairs?
- (4) What are the practical objects which the people and Parliament ought to set before them for immediate execution?

## IMPORTANCE OF THE FORESTRY PROBLEM.

For the purpose of demonstrating this, it will be necessary to indicate shortly the quantity of timber required by the country. In a paper I read before the Society of Arts on February 27, 1901, I gave detailed information regarding the outlook of the world's timber supply. This information I shall not repeat here, but limit myself to giving a few of the main points. In the first place, it must be stated that although the average forest area per head of population in Europe amounts to two acres, the imports of timber show already an excess over the exports amounting to 2,620,000 tons a year. That deficiency comes chiefly from Canada and the United States of America, and smaller quantities from Australia, India (nearly all teak timber), the countries round the Gulf of Mexico, the west coast of Africa, and a few other places.

It is well known that the supplies from outside Europe at the present rate cannot be relied on beyond a limited number of years, since the United States, as time goes on, will require all the timber which Canada can export, under the system hitherto followed in the latter country, where reckless cutting and disastrous forest fires are still the order of the day. Russia, with Finland, Sweden, Norway, and Austria-Hungary, which have so far supplied the rest of Europe, will not be able to maintain the exports of the past, owing partly to the gradual exhaustion of their surplus stocks, and partly to their increasing home requirements, due to the growth of their population and the development of industries. On the other hand, the requirements of the chief importing countries (excepting France) are rapidly increasing. The imports of the United Kingdom have grown from 3,400,000 tons in 1864 to 10,000,000 tons in 1899, or at the average rate of 189,000 tons a year. The imports of the latter year were valued at £25,000,000. The average annual value increment of the imports during the years 1890—94 amounted to £382,000 and during the period 1895—99 to £771,000. There has been somewhat of a check during the South African war, but signs are already discernible that the imports will resume their gradual rise.

Looking now at Germany, which takes the second place amongst European importing countries, we find that her net imports of timber up to 1864 amounted on an average to 13,000 tons a year. In 1899 they had risen to 4,600,000 tons, or an average annual increase of 131,000 tons. The value of the imports in 1899 came to £14,820,000.

The Belgian net imports of timber amount now to 1,020,000 tons, valued at more than £4,000,000. They have increased during the last thirty-five years on an average at the rate of 22,000 tons a year.

The net imports of France have remained practically stationary during the same period; they amounted to about 1,230,000

tons a year, or little more than the quantity now imported into the small kingdom of Belgium.

Of the total area of Great Britain and Ireland, 4 per cent are under forest.

Of the total area of Germany, 26 per cent are under forest.

Of the total area of Belgium, 17 per cent are under forest.

Of the total area of France, 18 per cent are under forest.

Pondering over all these figures, one is almost inclined to say that the requirements of timber are an index to the industrial development of a country.

Other European countries which import timber are Denmark, Italy, Spain, Holland, Switzerland (rapidly on the increase), Portugal, Bulgaria, Greece, and Servia; Roumania exports moderate quantities.

The price per ton of timber next demands attention. It fell from 1870 onwards until about the year 1888 in consequence of the enormous development of the means of transport, especially by water. From 1888 to 1894 prices remained stationary, but since then a slow but steady rise has taken place, amounting to about 18 per cent during the five years 1894—99. Fluctuations in the price will of course occur, but I have no doubt whatever that on the whole it will continue to rise, in the same degree as supplies have to be brought from localities farther and farther removed from the world's great highway—the ocean. This holds good especially in the case of Russia, the most important source of supply in Europe. Matters have now come to such a pass in that country that the Government has taken measures to ensure a permanent supply for home consumption by restricting and regulating cuttings. The head of the Prussian forest department informed me a year ago, that a remarkable change has of late taken place in the western provinces of Russia. German timber merchants, who go there to buy up and work out forests, used to send all the timber to Germany; now they transport already considerable quantities into the interior of Russia, because there they obtain better prices than in Germany. To sum up, it may be said that the quantity of timber required in Europe is rapidly increasing, so that the deficiency in the supply must advance correspondingly, making it more and more problematic whence the material, especially the coniferous timber, is to come in the future.

#### EFFECTS OF A SHORTAGE IN THE TIMBER SUPPLY ON THE UNITED KINGDOM.

It is all very well to say that we can pay for the timber we need, but that will not meet the case. When the supplies from outside fall off, the rise in prices may become prohibitive, and the effects of an insufficiency of material would be disastrous. Of the 10,000,000 tons a year imported lately into this country, 8,700,000 tons were coniferous timbers, which form the very staff of life of our building trade and mining operations. A

deficiency of supply in this material would be a real calamity for the population of these islands. Let us not deceive ourselves by imagining that in such an emergency iron and steel can be substituted for timber. That this is a fallacy has been proved by past experience. While the population of the United Kingdom has increased by about 20 per cent during the last twenty years, the imports of timber have increased during the same period by about 45 per cent; in other words, every inhabitant uses now considerably more timber than twenty years ago. At the same time, nobody can say that extraordinary efforts have not been made of late years to substitute iron and steel for timber. As a matter of fact, the latter is an absolute necessity to civilised peoples. Engineers have not even succeeded in superseding the wooden railway sleepers by steel sleepers. Mr. Hawkshaw, in his presidential address to the Institute of Civil Engineers the other day, dwelt particularly on this subject, saying: "Engineers could not do without timber, nor, indeed, without much timber. For the last thirty years they had heard it said in that room that steel would shortly be adopted in place of wood for sleepers; but although we could make our own steel, but had to import our timber sleepers, this has not come to pass," etc. The same experience has been gained in France and in the United States of America, the home of the great iron and steel Trusts. As to the effect of a shortage of the timber supply on the mining industry, it would be too terrible to contemplate, as it would practically bring mining to a standstill, and throw hundreds of thousands of workmen out of employment, and the same may be said of the building trade.

#### THE PRESENT STATE OF AFFAIRS IN THIS COUNTRY.

The United Kingdom of Great Britain and Ireland has an area of 78,000,000 acres (in round figures), of which about 3,000,000 acres are classed as under wood, equal to not quite 4 per cent of the area. This makes about  $\frac{1}{4}$  of an acre of woodland per head of population -- an area capable of yielding only a fraction of the timber required by the nation. Hence we find that the imports amount to at least five times the amount produced in the country. An examination of the agricultural returns of Great Britain and of those of Ireland show that there are extensive areas of waste land which yield either no return or a very small one. Again, there are other areas entered as mountain land used as rough grazing. These lands may be apportioned as follows:—

		Waste land, including inland water.	Mountain and heath land.	Total area in acres.
England ...	...	4 050,000	1,885,000	6,135,000
Wales ...	...	690,000	1,055,000	1,745,000
Scotland ...	...	4,250,000	9,410,000	13,660,000
Isle of Man and Channel Islands	...	45,000	18,000	63,000
Ireland ...	...	5,235,000	...	5,235,000
<b>Total ...</b>	<b>...</b>	<b>14,270,000</b>	<b>12,468,000</b>	<b>26,738,000</b>

I am not in a position at this moment to say what the area of inland water may amount to, but for argument's sake let us assume that there are of

Actual waste land	...	...	...	12,000,000 acres.
Mountain and heath land	...	...	...	12,000,000 "
Or a total of	...	...	...	24,000,000 "

This area is extensive enough to set people considering whether that land could not be used in a more profitable manner than at present. The question is, however, not so simple as it would appear at first sight, because nearly the whole of this land is private property, and most of it is utilised as shooting-grounds. The latter, however, after all is said, do not, even in Scotland, yield more than 1s. 6d. an acre all round, while the rest give much smaller returns, down to perhaps 3d. an acre, and in many cases not even that.

#### HOW TO OBTAIN A PERMANENT SUPPLY OF TIMBER IN THIS COUNTRY.

It is obvious that this country cannot interfere in the management of the woodlands of foreign countries. Again, under the enlightened principle followed by Britain, that her great colonies shall be self-governing, any interference with their internal management is out of the question. Amongst the latter, Canada and Australia take the chief places as regards the supply of timber. Although forest conservancy in Australia is anything but enlightened, we can count for a good many years to come on a considerable quantity of hard woods. These, however, will only serve for certain limited purposes, while 87 per cent of our imports are coniferous timbers, the supply of which requires our chief attention. Canada could furnish them, if the Governments of that country would put their shoulders to the wheel. Without going into details, I may say that the lumber and milling interests of Canada are so powerful, that it seems almost hopeless to expect a decided change of policy in the management of her forests. In the meantime the resources of the latter are rapidly decreasing.

Under these circumstances, let us consider what can be done at home. With the exception of about 67,000 acres of Crown forest, all British woodlands are in the hands of private proprietors, or one or two municipalities. Most of the woodlands are maintained for landscape beauty, shooting purposes or shelter, so that their yield cannot be considerably increased. Again, the 24,000,000 acres of land, of which I spoke above, are private property. Of that area a large portion is fit for afforestation, and the question arises whether this can be achieved, and if so, in what manner?

In a paper read before the Society of Arts in November 1899 it was boldly proposed that Parliament should allot £1,000,000 a



year during the next hundred years, so as to acquire and afforest 6,000,000 acres of land, which would yield all the ordinary timber required in the United Kingdom. It was argued that only the State was in a position to do justice to the scheme for any length of time, as has been done in other European countries. The position of Britain is, in this respect, somewhat different from that of other continental States. In the latter, the areas now forming the State forests were, with small exceptions, always State or Crown property, and it required only the gradual introduction of systematic and scientific management to render them highly remunerative. In Great Britain the lands are, as already stated, private property, and it would not be easy in England, or even in Scotland, to acquire large areas, because owners would not care to sell. In Ireland the difficulties would probably be much smaller. To expect Parliament to vote £1,000,000 a year, and for a hundred years, is, of course, Utopian, but I fail to see why the State should not do something on a smaller scale. A more modest sum might be set aside for the purpose, and either the Commissioners of Woods, or the Agricultural Department, or both, instructed to acquire any suitable surplus lands whenever opportunities offer. In this way the area of the State (or Crown) forests might gradually be increased in England, Wales, and Scotland.

In Ireland operations on a somewhat larger scale might be attempted. A new Irish Land Bill is about to be laid before Parliament, and provision might be made in it for the acquisition by the State of all waste lands which it is not necessary to include in the farms to be acquired by the tenants. In this way a considerable area might be obtained at a very low price. It has been estimated that of the 5,235,000 acres of waste lands in Ireland, not less than 3,000,000 are fit for afforestation. Most of these lands can be bought for from ten shillings to one pound an acre. Assuming that only half the area so bought is really fit for successful afforestation, the purchase price per acre of real forest land would be between one and two pounds per acre. At that rate the financial success of afforestation would be ensured. In Ireland, then, the State can, and in my opinion should, interfere by the direct acquisition of State forests. Such a measure would be a great help in the settlement of the Irish land question. The labour connected with the preparation and planting of the land, the subsequent management and working of the forests, and the development of industries which draw their raw materials from the forests, would provide just that class of additional work for the small Irish farmer, especially in the poorer districts, which will assist him in earning the necessary money to pay off the instalments which will gradually convert him into the proprietor of his farm.

In England, Wales, and Scotland the acquisition of State forests will probably be a very slow process. Here we must work

in a somewhat different way. We must count on extended afforestation by the landed proprietors, but the State should do what it can to help. The chief desideratum is to provide the means of acquiring a sound knowledge of systematic forestry as elaborated by scientific and practical investigation. First and foremost, the sons of the big landowners and young men who are preparing for the highest class of estate managers, must be given the opportunity of acquiring such knowledge. Hence the establishment of a course of forestry teaching should be arranged at Oxford, Cambridge, Edinburgh, and Dublin. Ultimately regular forest faculties may be organised at these Universities, or a joint faculty for forestry and agriculture, but at the outset we may be satisfied with the appointment of a lecturer on forestry at each of these centres of learning.

For practical instruction an area of 100 to 200 acres should be acquired at or near each university, where sowing and planting, etc., could be taught, and where illustrative experiments could be made. But something more is wanted ; and this has been fully explained in the Forestry Committee's report. There should be at least one larger area in each, England, Scotland, and Ireland, of from 2,000 to 10,000 acres, under a competent manager, where systematic economic forestry is carried out on a large scale. These State demonstration forests will serve a double purpose: they will afford the means of introducing university students to systematic and rational management, such as is likely to be adopted on the estates with which they will afterwards be connected. These areas must be managed as commercial undertakings, so as to produce the best financial results. In the second place, young men of the working classes can be received at these forests as working apprentices, giving them an opportunity of acquiring a sound knowledge of the business, thus fitting them for the posts of woodman, forester, or bailiff on the various estates of the country. Finally, arrangements may be made at agricultural colleges for instruction in forestry for the benefit of men who, while unable to pass through a university course, prepare for the management of landed estates.

As to the funds required for extended afforestation, these will no doubt be forthcoming in the case of many landed proprietors as soon as we have succeeded in convincing them that economically conducted forestry will pay a fair interest on the invested capital. In other cases, however, this will not be so. The Forestry Committee in their report have dealt with the question of State loans at low interest, and suggested that the matter might stand over for the present. I should, however, like to draw attention to the system of Co-operative Credit Organisations, upon which Mr. Montgomery published, in 1902, an interesting bulletin. Such Credit Organisations should be local, where members can obtain advances at a moderate rate of interest, either for a short

period or on the principle of a sinking-fund. Organisations of this class have, I understand, already been started in Ireland and elsewhere, but a further and considerable extension would doubtless prove of the greatest assistance to landed proprietors.

The financial aspect of the problem is, of course, of the highest importance, but at the same time it is most difficult to deal with, owing to the absence of suitable data. The Forestry Committee have taken a considerable amount of evidence on the point, and arrived at the conclusion that excellent results, even with indifferent management, have often been obtained from plantations formed on land of little or no value for any other purpose. Nobody expects that waste lands, which have for a long period of time been exposed to deteriorating influences, will at once spring into full production on being planted, and this is specially pointed out in the evidence; but there can be no doubt that most of our waste lands were once under forests, and, if the thing is done in the right way, can again be successfully afforested in spite of initial difficulties.

In order to show how proper management will lead to increasing financial prosperity, I propose placing before the readers of the *World's Work* a few data from the history of the Saxon State Forest. Saxony is a highly industrial country, and in this respect comparable with Great Britain. We have reliable statistical data about these forests since the year 1817, from which it appears that the area in 1817 amounted to 367,499 acres and in 1893 to 428,542 acres, giving an increase of 61,043 acres, equal to 17 per cent. These lands include good, bad, and indifferent soils, and the greater part are situated in mountainous districts up to an elevation of nearly 3,000 feet above sea-level. The yield in wood per acre amounted in 1817 to 61 cubic feet; in 1893 it had risen to 92 cubic feet, or an increase of 31 cubic feet, equal to 50 per cent. We do not know what the average stock of wood standing on each acre was in 1817, but in 1844 it came to 2,173 cubic feet; in 1893 it had risen to 2,658 cubic feet, representing an increase in fifty years of 505 cubic feet, equal to 23 per cent. This shows that, in spite of the greatly increased yield, the forests are now much more valuable than fifty years ago. The net returns (after deducting all expenses) show the following results *per acre and year* :—

During the period	1817—26	...	...	40 shillings.
"	"	1827—36	...	42 "
"	"	1837—46	...	47 "
"	"	1847—53	...	65 "
"	"	1854—63	...	100 "
"	"	1864—73	...	148 "
"	"	1874—83	...	175 "
"	"	1884—93	...	184 "
They rose further in 1900 to	...	...	...	225 "

I may add that the average receipts per cubic foot of wood were 2.1d. in 1817 and 4.5d. in 1900, a rise equal to 114 per

cent., while the above figures show that the net receipts per acre have during the same period risen by 462 per cent.

Surely here is an incontrovertible proof of what scientific and systematic management of woodlands can achieve!

There are many other important points connected with this subject which I should have liked to discuss, but want of space prevents my doing so. Enough has, I hope, been said to demonstrate the extreme importance of the problem, and the simple steps imperatively called for to solve it.—*World's Work*.

### The Timber Trade of Manchuria.

In view of the great interest just now taken in all matters concerning the Far East, the account of the operations of Russia to capture the timber industry in that district will be welcome. The following particulars were supplied to *The Columbia River and Oregon Timberman*, by Mr. H. B. Miller, the United States Consul at New Chwang:—

There are many lumbering enterprises being established in Manchuria, Siberia, and Saghalin, preparing to compete with the Pacific Coast lumber.

The most important is the Russian Timber and Mining Company, of the Far East, with headquarters at Port Arthur. This company is organised by some of the most prominent men connected with the Russian Government, and has a very large capital of 20,000,000 roubles, so it is reported.

Their principal operations will be on the Yalu River, where they run down timber from the forests of Corea as well as the large forests of Manchuria. I have been informed by men who have seen these forests that they are very extensive, and contain immense quantities of exceedingly fine timber. There is much fine timber in this market from that locality, and it has been the source of supply for both this and the Tien Tsin market for ages.

The ocean and river junks are built of this timber, hewn out in large pieces—often three feet and more in width. There are about 25,000 of those junks trading in this port. The timber is mostly pine, very much like the white pine of our country. This is the best quality of lumber that I have seen in China. The per cent of clear is not very heavy.

There is also considerable fir, usually much smaller than the pine, and also a timber similar to our tamarack. These are the three varieties that I have seen from the Yalu district. It is brought into this market and the other markets of China on junks. These junks when coming to this market usually sail in fleets as a means of protection against pirates, who often board them near the mouth of this river and rob them or levy tribute on them.

Most of this timber is driven or rafted down the Yalu in short lengths, and it is almost impossible to get long timbers

from this district. The Chinese in their native affairs seldom use any but short timbers, and all the timber cut for Chinese consumption is cut into short lengths in the forests.

Up to the present time all these logs from this section have been cut into lumber by the whipsaw method of the natives, using a thin and narrow saw blade with teeth set so as to cut both ways of the saw's motion. Where the Russians have charge of this native saw mill they have introduced the large and heavy saws, cutting only on the downward stroke, such saws as are used in our country for whipsawing lumber, and with these the natives accomplish much more.

On the Yalu this old method is now to give way, and Russia is to construct there at the mouth of this river the third largest saw mill in the world. I have not been able to get the details or to ascertain whether the mill is to come from America or not; but it is certain that a great mill enterprise is already in process of construction.

This is at the point of political controversy and the most likely place of conflict between Russia and Japan. It is at the place of the great naval battle between China and Japan, the conclusion of which practically settled the fate of that war.

The establishment of this enterprise is very likely to influence the lumber trade of China to some extent, but more particularly in Manchuria and North China. I am inclined to the opinion that it will not seriously affect the trade in Central China.

In addition to this competition, which is already supplying large quantities of timber and lumber at Port Arthur, Dalny and New Chwang, and for the Chinese Eastern Railway, the Russians are now shipping to all of these places by steamer from Vladivostok and vicinity and the Island of Saghalin large quantities of lumber.

This lumber from that section, so far as I have seen, is of a rather inferior quality compared with the Yalu lumber, is harder, coarser grained, warps and twists badly and is difficult to work. Compared with the Yalu timber, it is about like the Norway pine as compared with the white pine. It is in fact very much like the poor grade of Norway pine. What I have seen may not be the best quality, however. I am informed that the forests of Siberia and Saghalin Island are quite extensive, and that the lumber production in that section is susceptible of great development.

This information I have from very reliable sources, but I cannot write of it from personal observation. Mr. Clarkson, formerly of Portland, Oregon, has a saw mill and sash and door factory at or near Vladivostok, and is reported to be having much success in this and other enterprises.

Another point of Russian competition in the lumber business is developing on the River Sungari, where the Chinese Eastern Railway crosses it, about 80 miles south of Harbin. Timber in:

considerable quantities is run down this river to this point, and is being made into lumber by the Chinese method, several hundred men being engaged in the work. I am of the opinion that lumber from this source will never reach the sea in competition for the trade of China ; but it will be a splendid source of supply for railway use and for the city of Harbin.

This timber, so far as I have been able to see, is a fair grade of white pine, but the logs are all small. Whether this is due to the difficulties of driving on the stream or to the small growth in the forests I have not been able to learn.

Harbin is to-day only three years of age, but is one of the greatest cities of Asia, and contains the largest European population of any Asiatic city, containing 60,000 Russians besides the soldiers. At Harbin there are two small saw mills cutting timber from the River Sungari, coming from below the city. On the railway line between Harbin and Vladivostock there are two large saw mills, the machinery for which cost in place 150,000 roubles. These mills are engaged in cutting lumber at present for the railway and for the town of Harbin.

It is clear that Russia intends to provide for all the requirements of lumber in Manchuria and Siberia with a possibility of entering the Chinese market.

The Government has established a ruling that all railway and Government supplies must be purchased from Russian companies if possible, and this is encouraging many industries in Manchuria, and the lumber industry is one of them.

The recent purchase of considerable quantities of lumber from the United States was due to the haste in providing quarters for troops necessary to take care of the large army she has in Manchuria, and to hurry to completion many buildings and structures required to carry out her occupation. The railway will require many ties or sleepers, as they are decaying very fast, and many have to be replaced even before the railroad is completed.

This is due to the fact that the railway is not yet ballasted, and the ties are laid deep in the earth and sand, not even the ends being exposed to the air. These ties are now coming in considerable quantities from Siberia and Japan, and I do not believe it possible for our country to compete for the trade.

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FORESTRY IN THE HAWAIIAN ISLANDS.—*The Hawaiian Planter's Monthly* publishes the report of the Committee on Forestry which was lately formed to devise some practical method of establishing forestry reservation in the Hawaiian Islands. The method devised would appear to be original. The Committee recommended the Governor to appoint some person in each district who should take upon himself the responsibility of making a map and description of a proposed forest reservation in such district, to be submitted

to the Governor for approval. If the proposals were accepted, the persons appointed in each district were to secure subscriptions to secure the fencing of the reservations. The Committee also recommended to the Governor the names of certain persons who were to take up those apparently uncontrolled and unrewarded duties. A bill was subsequently passed for the constitution of a Board of Forestry and Agriculture, to consist of five members. The Board has subsequently been organised and placed itself in communication with the Bureau of Forestry at Washington. The Bureau with characteristic energy forthwith deputed an officer to Honolulu to inspect, and as a result of his inspection and report, the Bureau has at the request of the Governor of the Hawaiian Islands, recommended the appointment of Mr. Hosmer, one of its own officials, to be Superintendent of Forestry in Hawaii. He will work under the Committee on Forestry, which has appointed several gentlemen as unpaid Forestry Agents in their respective districts.

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**FORESTRY INSTRUCTION AT THE FOREST OF DEAN.**—With a view to giving effect to the recommendation contained in paragraph 25 of the Report of the recent Department Committee on British Forestry, the Commissioner of Woods, in charge of Dean Forest, and the Highmeadow woods adjoining, has arranged, with the sanction of the Treasury, to start an experimental course of instruction for student woodmen who will be employed in these Crown woods during the time of their training. Mr. C. O. Hanson, of the Indian Forest Service, has been appointed Instructor, under the supervision of Mr. Philip Baylis, the Deputy Surveyor of Dean Forest. The classes will be held in the Crown Office, Coleford, and will begin about the middle of January 1904. The course will be spread over two years, and will include instruction in Forestry, Botany, Sylviculture, Forest Mensuration, and Protection of woods. Eight young men have applied to become students, six from the Forest of Dean, where they are already employed, and two from Windsor. This is as many as employment can be found for at present. It is hoped that next year, when the first eight will have completed the first part of the course, and will go on to the second part, that eight more may be taken on to take up the first part in succession. At the end of the first two years, and every year afterwards, an examination will be held, and those student woodmen who pass satisfactorily will receive a certificate, signed by the Commissioner of Woods and the Deputy Surveyor of Dean Forest.

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**RE-AFFORESTATION IN ITALY.**—Mr. Neville-Rolfe, British Consul in Naples, refers in his latest report on his district to the widespread interest now being taken in Italy in the ques-

tion of re-afforesting the country. In 1877 about four millions of acres were withdrawn from the operation of the old forest laws, as well as about one million acres in Sicily and Sardinia. The consequence was a reckless destruction of forests; and now it is generally admitted that the State must step in to save those that are left and to aid in replanting. The question now being discussed is, What trees are to be used for the latter purpose? The Italian oak is of little use except for railway sleepers; there is plenty of chestnut all over the country, and pine trees would grow luxuriantly and prove most useful. The cork tree, however, appears to be the one which would prove economically the most valuable, and it has hitherto been almost wholly neglected in Italy. In 1900 the cork exported was valued at only £36,000, and much, no doubt, was used at home. But a few years ago, Spain exported wine corks to the value of over a million sterling. In Italy about 80,000 hectares of land are under the cork tree, chiefly in Sicily and Sardinia; in Portugal, Spain and Algeria the areas respectively are 300,000, 250,000, and 281,000 hectares. The Calabrian cork forests have been almost wholly destroyed, the trees having been burnt for charcoal, and even Sicily now imports cork wood in considerable quantities. Seventy years ago nearly all the cork imported into England came from Italy; but since then most of the Italian forests have been destroyed for charcoal, and to produce potash, and those that remain are being devastated for the same purposes; and no one thinks of replanting the ground, which naturally gets washed away owing to the absence of trees. Large forests containing a majority of cork trees are continually being released from the forest laws, and there is a risk that the production of cork in Italy will soon cease. Nothing can replace cork in its manifold use, and now, when vast quantities are used in making linoleum and in shipbuilding, an adequate supply of it is of great economical importance.—*The Times*, April 21st, 1901.

Mr. E. JACKSON, the Port Engineer of Karachi, has carried out some interesting experiments regarding the comparative value of sleepers of jarrah wood, deodar and babul wood. It has been found that exposure to the sun's rays cracks the jarrah wood more quickly than it does the deodar. Sleepers placed for three years under water of both jarrah and deodar are found to have been practically unaffected, but the jarrah wood was a little brighter in appearance; the babul was, however, almost destroyed by marine insects. The experiments go to show that as regards durability there is little to choose between jarrah wood and deodar, but the deodar is considerably cheaper, costing Rs. 4; while the jarrah costs Rs. 4-6 a sleeper. The deodar has also the advantage of being lighter in weight, and thus is less costly in transport and in laying down. While deodar sleepers can



be easily moved or carried by a couple of coolies, it takes four to move one of jarrah wood.

**TEACHING OF FORESTRY IN THE PROVINCES.**—The Technical Educational Committee of the Fife County Council have issued a circular intimating that they have made an arrangement with the Edinburgh and East of Scotland College of Agriculture under which Mr. Fraser Story, who studied Forestry at Edinburgh University and at Eberswalde Forest Academy, will conduct a course of nine lectures and two out-door excursions at Kirkcaldy and Cupar during the months of December, January, and February. In the circular the Committee say: "It is the intention of the Committee in these lectures to provide systematic scientific instruction of such a kind as to be readily adapted to local circumstances. As far as possible the class lessons will be of a practical kind, and further provision will be made by which the students will see for themselves the best methods to be carried out in daily practice."

#### VII.—TIMBER AND PRODUCE TRADE.

##### Churchill and Sim's Wood Circular.

3rd March, 1904.

**EAST INDIA TEAK.**—The deliveries for February amount to 908 loads as compared with 999 loads in February last year, and for the two months of 1904 they are 1,787 loads against 1,566 loads for the same period of 1903. There is little change to report in London, prices being perhaps a point firmer. The Dock stock does not increase, and the prospects for any supply of market cargoes continue unfavourable.

**ROSEWOOD—EAST INDIA.**—For good wood there are ready buyers at fair prices, but inferior logs are not readily cleared.

**SATINWOOD—EAST INDIA.**—There has been rather more enquiry, but sales are checked by high prices asked.

**EBONY—EAST INDIA.**—Some sales of inferior wood have been made, but the general demand is quiet.

#### PRICE CURRENT.

Indian teak, logs, per load ...	... £10 to £18
„ „ planks, „ ...	... £12-10s. to £20
Rosewood, per ton ...	... £6 to £12
Satinwood, per s. ft. ...	... 9d. to 2s.
Ebony, per ton ...	... £5 to £10

**Denny, Mott and Dickson, Limited.****WOOD MARKET REPORT.****LONDON, 1st March, 1904.**

**TEAK.**—The landings in the docks in London during February consisted of 254 loads of and 337 loads of planks and scantlings, or a total of 591 loads as against 1,184 loads for the corresponding month of last year. The deliveries into consumption were 505 loads of logs and 282 loads of planks and scantlings—together 788 loads, as against 878 loads for February, 1903.

The Dock stocks at date analyse as follows:—

	6,653 loads of logs, as against 5,413 loads at the same date last year				
4,109	„ planks	„	2,693	„	„
—	„ blocks	„	—	„	„
<hr/>					
Total	10,762 loads	„	8,106 loads	„	„

The consumption of logs has been very satisfactory from the standpoint of the moderate import; but the demand for planks continues to show a great falling-off, and shippers are being compelled to recognise that teak conversions are a luxury rather than a necessity, and, therefore, the recent high level of price has greatly discouraged their use for purposes outside the ship-building and rolling-stock industries. Europe generally is nervously anxious to develop naval strength, and, in the construction of warships, teak logs continue to be a necessity; but this fact will scarcely serve to avert a serious fall in the price of planks unless shippers can market the bulk of their cut stuff in the East. Whether the war between Russia and Japan will widen the outlet for the teak conversions of Burma and Siam is not yet clear, but the tendency of war is to restrict imports by the nations involved.

February has rather served to deepen the general business gloom, helped by the outbreak of the war between Russia and Japan. The softwood market is in a state of suspense, but the hardwood market has been steady as a whole—although financial anxiety applies all round.

112 THE HISTORY OF THE UNITED STATES

CHAPTER I

THE UNITED STATES

OF AMERICA

THE UNITED STATES OF AMERICA, known as the United States, is a country in North America.

It is the largest country in the world by area, and the third largest by population.

The United States is a democratic country, and is known for its freedom of speech and religion.

The United States is a member of the United Nations, and is one of the five permanent members of the Security Council.

The United States is a country of many different people, and is known for its diversity.

The United States is a country of many different cities, and is known for its big cities.

The United States is a country of many different states, and is known for its states.

The United States is a country of many different people, and is known for its people.

The United States is a country of many different cities, and is known for its cities.

The United States is a country of many different states, and is known for its states.

The United States is a country of many different people, and is known for its people.

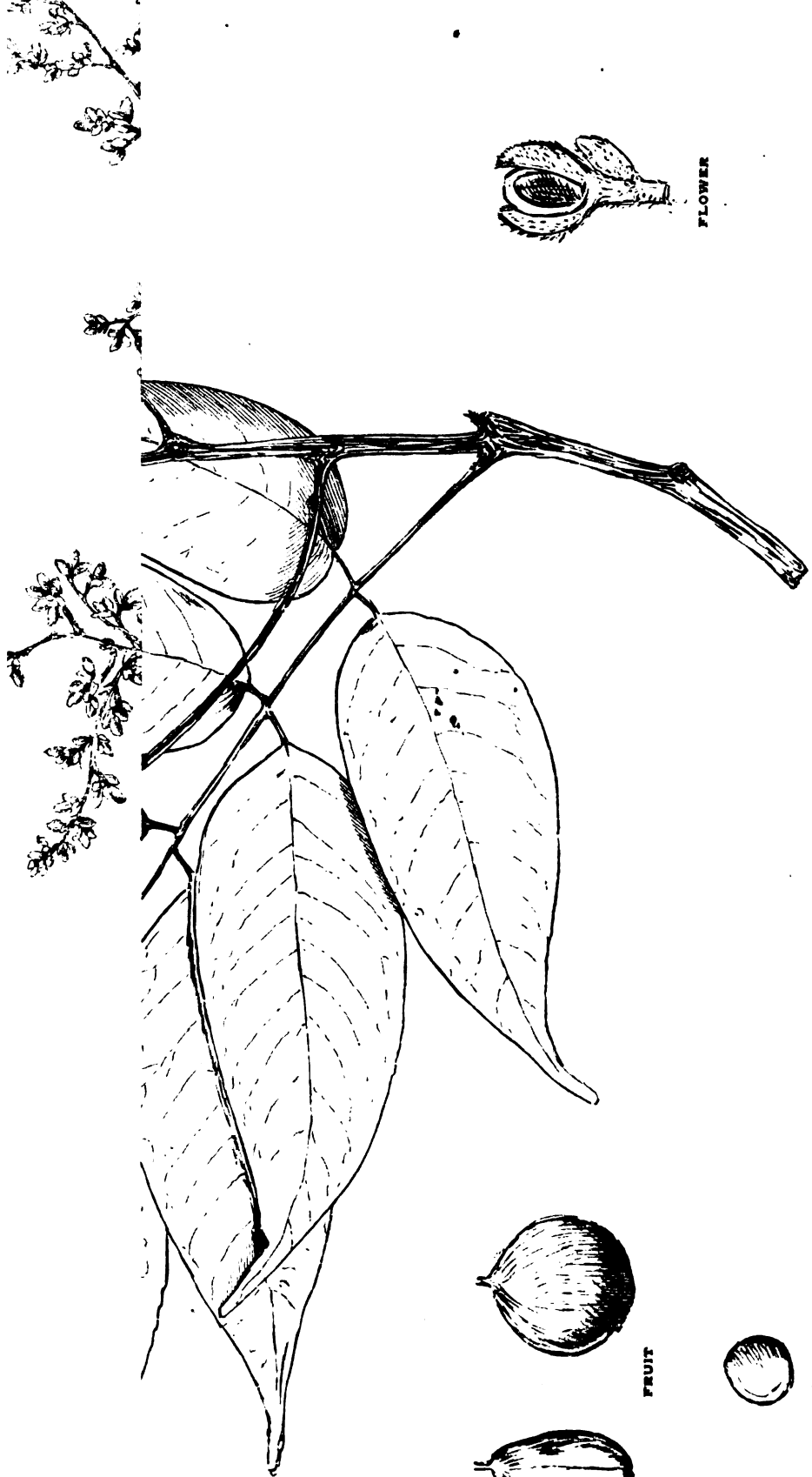
The United States is a country of many different cities, and is known for its cities.

The United States is a country of many different states, and is known for its states.

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# **DIALIUM TRAVANCORICUM, BOURDILLON**

A. P. CORTEZ & CO. LITH. BOMB.

M. M. Bourdillon dett

# THE INDIAN FORESTER.

VOL. XXX.]

JUNE, 1904.

[No. 6.]

## ***Dialium travancoricum.***

A NEW SPECIES COMMUNICATED BY J. F. BOURDILLON, F. L. S.

### **LEGUMINOSÆ.**

*Dialium travancoricum*—Sp. Nova. Mal. "Malam puli."

Leaves imparipinnate, rachis 5 in., slender, leaflets 7—11, sub-opposite or alternate, shortly stalked, thinly coriaceous, glabrous, ovate, cuneate-acuminate rounded at the base and dark green, each 2—3 in. by  $\frac{3}{4}$ —1 $\frac{1}{4}$  in. Flowers small, numerous in lax, terminal and axillary fulvous-pubescent panicles, each  $\frac{1}{2}$  in. long. Sepals 5, much imbricated, brown and very pubescent. Petals 0. Stamens 2, erect, with large, subsessile anthers. Ovary oblique, very hairy, with 2 ovules. Legume spherical, but laterally much compressed,  $\frac{3}{4}$  in. across and  $\frac{1}{2}$  in. thick, dark velvety brown, containing one pale brown seed.

A magnificent evergreen tree occurring in the forests of South Travancore near Ponmudi between 1,000 and 2,000 ft. and very local. Height 100 ft. Diameter 3 ft. Flowers July—September. Fruit ripens May-June. Bark pale brown, smooth,  $\frac{1}{2}$  in. thick. Wood brownish-grey, marked by lines of darker colour, hard, smooth and close grained. Centre darker, but no heart. Pores rather scanty, large and evenly distributed. Medullary rays very fine and conspicuous, crossed by numerous concentric lines of paler tissue, giving the wood a mottled appearance. Annual rings marked by darker lines about 10 to inch.

Weight = 57lbs. P = 894.

The fruit is called by the hillmen the "hill tamarind." The endocarp is bright red and spongy in texture and is slightly acid. It is greedily eaten by birds of all kinds when the tree is in fruit. The wood is strong and useful, but is not at all used. The tree is well worth cultivating for its very ornamental appearance.

I first noticed this tree many years ago, and for a long time assumed that it was the Ceylon *D. ovideum*, but a comparison of the flowers, fruit, and timber with the description of them given in Trimen's *Flora of Ceylon* showed that the two were distinct, an opinion subsequently confirmed by an examination of the timber of the Ceylon tree at Peradeniya, and of its flowers at Kew. The chief points of difference are that (1) the leaflets are more numerous and broader than in *D. ovideum*. (2) The flowers are nearly globose on stout short pedicels and are covered

with tomentum in *travancoricum*, while in *ovvideum* the flowers are long and pointed, on long slender stalks and are glabrous. (3) The anthers of *travancoricum* are subsessile, but in *ovvideum* filaments are as long as the anthers. (4) The fruit is round and compressed in *travancoricum* with a bright red endocarp, but in *ovvideum* the fruit is ovvid and the endocarp is buff coloured.

When the late Mr. Lawson, Government Botanist, visited Travancore at the end of 1893 I pointed out this tree to him, and we picked up some of the fruit, which was sent to Calcutta. A reference to it appeared in the *Journal of the Asiatic Society of Bengal*, lxi, ii, 483, while in Gamble's *Manual of Indian Timbers*, page 276, our tree is provisionally named *D. coromandelianum* Hontt. By the courtesy of Major Prain, I.M.S., I have been able to obtain a copy of the description of the above named tree, published by Honttuyn in 1773 at Amsterdam, and also a copy of his illustration of it. From these it is evident that Honttuyn's tree was not the same as ours, and this is not surprising, seeing that *D. travancoricum* is a very local tree, being confined, as far as is known at present, to a very limited area, and is not likely to occur on the Coromandel coast. Honttuyn describes the flowers of his tree as being yellow with green stamens, and of the latter the illustration shows 5, and not 2. The leaflets are said by him to number 4 or 5, and to have white veins, which the illustration clearly shows, and neither of these characters fits our Travancore tree (cf. *Brandis Indian Trees*, p. 251).

The illustration shows—

1. Flower with 2 sepals removed showing the large subsessile anthers, all  $\times 6$ .
2. Fruit natural size.
3. Seed natural size.

J. F. BOURDILLON.

QUILLON, 26th March 1904.

### The Afforestation of Great Britain.

In the debate on the address in the House of Commons in February last, Mr. Keir Hardie moved an amendment in which he expressed regret that the Government had not seen fit to recommend the creation of a department of labour empowered to deal effectively, in conjunction with local authorities, with the problem of the unemployed by the execution of public works, afforestation, and the encouragement of agricultural pursuits.

The following is the *Times*\* summary of the answer given by the Minister for Agriculture:—

Mr. Long expressed his great sympathy with the deserving unemployed, a sympathy which was shared by every member of the House. It was only, he pointed out,

\* The London *Times* for Saturday, February 20th, 1904.

when they came to the consideration of the remedies that should be applied, that differences of opinion disclosed themselves. The Government did not believe that there was any necessity for the establishment of a labour department. It had been suggested that as an alternative the Local Government Board should be strengthened; but even if that were done, the difficulty of providing for the unemployed would continue. Some members desired that the obligation of finding work for the unemployed in London should be thrown on the metropolitan area as a whole; and to them he was bound to point out that his department was in the position of trustees for the ratepayers, and that so serious a change ought not to be effected without most careful consideration. He failed to see how a labour department could do more than could be done by the Local Government Board and the Board of Trade. The idea that a special department could make arrangements for setting up Imperial works, country works, and local works was not practical. As to afforestation on a vast scale, which was the second remedy advocated, he must point out that nothing of the kind had ever yet been undertaken by the State. It had always been the custom in this country to leave remunerative works to private enterprise. But even if a great scheme of afforestation were started, the majority of the unemployed would not be benefited, for, having no experience of work upon the land, they could hardly be set to digging, draining, and planting. As to the men who were willing and able to do ordinary agricultural work, they would find very little difficulty in obtaining employment, if they looked for it.

When the Minister for Agriculture can get on to his feet in the House and answer a practical proposal, apparently to the satisfaction of the majority of members, in the above fashion, progress in the afforestation of Great Britain would appear to have gone a long step backward as far as the English Ministry are concerned, since the lamented death of that far-seeing Minister Mr. Hanbury. Mr. Long's expressed sympathy with the unemployed would not appear to go very deep since almost in the next breath he makes them out to be absolute incapables. We read that he is of opinion that they, through inexperience, could not be set to digging and draining and planting work. How much experience is required to dig a hole a foot square on a barren moor or to trench and drain such an area. Mr. Long can scarcely mean that the unemployed of London and other great cities are unable to handle a spade or do not know what the implement looks like. Thousands are employed clearing the streets after a snowstorm in London, and L.C.C. notices all over the town at the present moment state that the men are to bring their spades with them if they wish employment. We admit that the planting does require some experience, but only such as an average man, and more especially the average Londoner, who, if nothing else, is quick and



smart enough when he likes, would quickly pick up. But to any one who pretends to have the slightest acquaintance with agricultural matters, we will not say forestry matters, the spectacle of a British Minister solemnly telling members in the House of Commons that trenching and pit digging would be quite beyond the powers of the unemployed, and *per contra* that afforestation is quite out of the range of practical feasibility in Britain, would be ludicrous in the extreme were it not for the much-to-be-deplored ignorance and conservatism it gives evidence of. But it would not have been difficult to expose this ignorance, and it seems a pity that it did not occur to Mr. Keir Hardie to ask Mr. Long how it happens that Londoners have proved themselves so apt as hop pickers. That garden of England, the county of Kent, is as full of hop pickers as a porcupine of quills in September, and the twang which is the most familiarly heard on all sides is the dreadful Cockney one. Most owners of hop gardens will tell you that although the Londoner requires to be looked after pretty smartly, for he is not averse to lifting anything and everything he can lay hands upon, yet in the field at his work he will do as much again as the country labourer in half the time. In the same manner that the Londoner has learnt to become an adept in the hop field in the autumn, so would he and the unemployed in many other great towns quickly learn the rougher part of the woodcraft he could be put to through the long winter months were the British Government to follow the lead of every other State of importance in the world, and commence planting up its waste lands.

But Mr. Long's answer goes deeper, and therefore is more serious, than Mr. Keir Hardie's question necessitated. I would draw attention to the words "As to afforestation on a vast scale, which was the second remedy advocated, he must point out that nothing of the kind had ever yet been undertaken by the State. It had always been the custom in this country to leave remunerative works to private enterprise."

These words put the Minister's attitude in a nutshell. In the past our islands were covered with thick forest. As the population grew more intense, this was hacked down until not a bit of timber worthy of the name was left in the country. Our supremacy at sea and our vast coal-fields have enabled us to do without these absent forests up to the present time. We have our coal for fuel purposes, and we are rich enough, and apparently content enough, to pay a large price for imported timber much of which could be grown at home at less cost, whilst at the same time furnishing work for a large number of our unemployed. This is the present position, and the Minister for Agriculture does not see why we should depart from it, because forsooth "nothing of the kind had ever yet been undertaken in the State." Every forester, and many others who have

cared to take the trouble to study the question, knows that the day must come, and is much nearer than is dreamt of in our Islands, when the question of the afforestation of some part of them will be one of the very first importance. It will then be found that with all our wealth this is one of the few things that a vote in Parliament for the necessary money will not be able to remedy. Such a vote can now place battleships on the sea, encircle the country with heavy forts and giant guns, build docks and raise regiments in a comparatively short space of time, but the then Minister of Agriculture will find that it will be quite impossible to create forests which will be able to give any yield in timber that he or the majority of the House who agree with him will ever see.

And this brings us to the fallacy in the second portion of the above-quoted extract —“It had always been the custom in this country to leave remunerative works to private enterprise.” Has Mr. Long ever heard of a country called India, and is he acquainted with the general lines of Government policy in that vast country? The above words have a very familiar sound. They are to be found in many an Indian official document and reply, for this is also the policy of the Indian Government. But it stopped short at Forestry. It is a good many years ago now since forest conservancy was introduced into the country. It is said, and it has been proved times without number, that every good move, every new departure, for the amelioration or the safeguarding of the interests of the human race is ever met by the strongest opposition, has to cope with ignorance and conservatism, or, to call it by its proper term, crass obstinacy on the part of the race in general and of some of its strongest men in particular. The introduction of Forestry in India was no exception to the general rule, and that the policy triumphed over all opposition, that the work was carried on often under the most trying conditions both mental and physical to its advocates until the present great department arose into being but shows the absolute necessity that existed for such, and the justness, the clearheadedness and longsightedness of those responsible for its inception. It was realized, and realized once and for all, perhaps hastened by the fact that there is not in India that large amount of capital always ready for investment to be found in England, that the formation and maintenance of the forests was not, could not, be left to the private person, to the capitalist, the company promoter, *et hoc genus omne*, for the very good reason that from the very nature of such property early returns from large areas were not a possibility. When capital has to be locked up for a number of years, when neither the capitalist nor his son nor the company promoter, nor his shareholders will in all probability ever see any return in cash for their outlay, one can scarcely, Mr. Long knows well that one cannot, expect or hope that great financiers will lay out their money in this fashion. To leave the afforestation of the British Isles to private enterprise is

tantamount to saying that the benefits of such afforestation are not believed in by the present Ministry, that last year's great talk upon the subject was quibbling and moonshine, and that the problem of the unemployed, for that it could to a large extent be solved in this way, and perhaps only in this way, few who have studied the matter doubt, is still to remain unsolved and neglected. We would like to see the House appoint a Board placing on it some of the experts ready to their hand, some of the retired Indian Forest officers of experience, who form a valuable asset to which the country can turn if it cares to. We should like to see the Board request these officers to draw up a preliminary working scheme for treating certain areas, to be put into force as soon as drawn up. We should like to see a sum of money provided for this propose; 'twould be but the merest trifle from the great national purse. It would not be long before the question of the advisability, applicability and practicability of the afforestation of Great Britain answered itself, the answer carrying with it a commencement of the settlement of the unemployed question—a settlement of which no Government has yet provided even the smallest solution to.

E. P. STEBBING.

### Notes on Sandal.

BY M. RAMA RAO, MADRAS FOREST DEPARTMENT.

MR. P. M. Lushington's article on this subject in the January number of the *Indian Forester* will doubtless be read with much interest and profit by those who, like myself, have sandal tracts to manage. Mr. Lushington has already contributed a great deal to our scanty knowledge of the habits and growth of sandal, and I hope that as he is still earnestly studying the subject he will give us more information still. In the meantime I venture to offer the following remarks on the subject for the perusal of Indian Foresters:—

#### I.—ROOT-PARASITISM.

2. Since writing my note that appeared in the September number of the *Forester*, I have continued the investigation and study of this peculiar habit of the sandal, and have found unmistakable evidences of its parasitism on the roots of upwards of seventy different species of plants belonging to various natural orders. In fact, I have hardly come across a plant growing within reach of a sandal whose roots have not borne traces of attack by sandal roots, though some species are more largely preyed upon than others.

As a detailed account of my investigations in this direction will form the subject of a separate record, there is no need to enter into details here. It may, however, now be safely asserted that the root-parasitism of sandal discovered so far back as 1871 by Mr. Scot, and altogether ignored till very recently, when Mr. Barber

re-discovered it, if I may say so, is now beyond all doubt an established fact, and that it plays a part in the growth and development of the tree the importance of which has never hitherto been suspected.

## II.—CONGENERS.

3. I am now in a position to endorse all that Mr. Lushington has said on this head, since I have found the root connection of sandal with all the species mentioned by him except *Terminalia chebula* and *Acacia sundra*, which I have not yet examined. But I see no reason to exclude *Litsæa zeylanica* and *Albizzia amara* from the list of congeners, for they are not only associated with the sandal but have also root connection with it, although *Albizzia amara* is not commonly found on the upper slopes and plateau of the Javadiis.

4. I would add the following to the list of congeners given in my article above referred to. Every one of these species was found to have been attacked by the sandal roots:—*Terminalia arjuna* [along streams and in moist places], (2) *Wrightia tomentosa*, (3) *Mimusops indica*, (4) *Alseodaphne semicarpifolia*, (5) *Diospyros inontana*, (6) *Cudrania javanensis*, (7) *Kuttu tamattai* [a large leguminous climber with purple flowers and broad and long pods], (8) *Maniputtan* [Tamil], a woody shrub, (9) *Ventilago madraspatna*, (10) *Cipadessa fruticosa*, (11) *Karallan kodī* [Tamil], an asclepiad resembling somewhat *Hemidesmus indicus*, (12) *Sida carpinifolia*, (13) *Casearia tomentosa*, (14) *Elæodendron roxburghii*, (15) *streblus asper*, (16) *Anona squamosa*, (17) *Phoenix sylvestris*, (18) *Clitoræa ternatea*, (19) *Azima tetracantha*, (20) *Protium caudatum*, (21) *Adhatoda vasica*, (22) *Alangium lamarckii*, (23) *Cucurbita dioica*, (24) *Grewia* sp. [Tamil Pannipudukkan], (25) *Sittavarai* in Tamil, a leguminous herbaceous twiner with a tuberous root, (26) *Tinospora cordifolia*, (27) *Acalypha fruticosa*, (28) *Acalypha indica*, (29) *Plumbago zeylanica*, (30) *Achyranthus aspera*, (31) Prickly pear [*Opuntia dillenii*], (32) *Jatropha curcas*, (33) *Ficus bengalensis*, (34) *Pandal* [*avarai* a leguminous climber grown in gardens], (35) *Morinda citrifolia*, (36) *Ochalandra rheedii*, (37) *Holoptelca integrifolia*, (38) Grasses such as *Cynodon dactylon*, and (39) *Elensine Egyptiaca*. Some of the above species are very sparingly attacked, while others are extensively so by sandal roots. To the above may be added (40) *Inga dulcis*, (41) *Eucalyptus globulus*, (42) *Dalbergia sissoo*, and (43) *Thespesia populnea*, all of which were found largely connected by their roots with the sandal in the Forest compound at Denkanicotta.

I have also observed sandal associated with teak (*Tectona grandis*), blackwood (*Dalbergia latifolia*), *Pterocarpus marsupium*, *Canthium parviflorum*, *Ixora parviflora*, *Cordia myxa*, *Cordia vestita*, *Buchanania latifolia*, *Cassia fistula*, and *Agave americana*, and though I believe they are attacked by sandal, I have not examined their roots.

## III. — GIRTH CLASSES AND WEIGHT OF SCENTED WOOD.

5. A register showing the girth at breast height and weight of scented wood of each tree felled has been maintained in each range of the Salem District since 1901-02. I take the figures of the Tirupatur Range as being the most accurate, the operations having been conducted by an Extra Assistant Conservator, and frequently inspected by myself. The subjoined table No. 1, based upon the results of the fellings of 1902-03 and 1903-04, shows the yield of the several girth classes at different altitudes on the Salem Javadis. The altitudes are taken from the 4-inch maps prepared by the Survey of India party. As the trees selected for felling during 1902-03 were restricted to those of and above 40 inches in girth, and in 1903-04 to trees above 36 inches, the lower girth classes are but thinly represented and do not admit of a fair comparison with the figures given by Mr. Lushington. Such as they are, they show that the yield of scented wood on the Javadis is much greater in almost all girth classes than in the sandal tracts of the North Coimbatore District, irrespective of the differences in altitude. As far as I can gather from Mr. Lushington's notes, the conditions of growth of sandal in the Coimbatore District are all that could be desired, and I therefore take it that they are not less favourable than those obtaining on the Javadis. If this were so, the causes for the smaller yield of scented wood in Coimbatore require to be studied. Prior to the introduction of detailed instructions in 1895-96 and their stringent enforcement in the Salem District, the yield of scented wood was no better but was perhaps worse than in the Coimbatore District.

TABLE NO. I.

Table showing yield of scented wood (heartwood) in the several girth classes of sandal trees growing at different elevations on the Sulem Javudie, ascertained from fellings of 1902-03 and 1903-04.

Girth classes.	ALTITUDE (ELEVATION ABOVE MEAN SEA-LEVEL).												AVERAGE YIELD PER TREE OF EACH GIRTH CLASS IRRESPECTIVE OF ALTITUDE.	No. of trees.	Average calculated by totalling weights of each tree and dividing by total No. in the girthclass.
	3,800.'	3,800.'	3,800.'	3,900.'	3,900.'	3,900.'	3,900.'	3,900.'	3,900.'	3,900.'	3,900.'	3,900.'	3,900.'	3,900.'	
16"-18"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19"-21"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22"-24"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25"-27"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28"-30"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31"-33"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34"-36"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37"-39"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40"-43"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43"-45"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
46"-48"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
49"-51"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
52"-54"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
55"-57"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
58"-60"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
61"-63"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
64"-66"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
67"-69"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
70"-72"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
73"-75"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

\* Maturely dead tree. † One tree dead and yielded 45 lbs. only. ‡ Dead trees. § One of the trees yielded 1,185 lbs. ¶ One of the trees yielded 1562 lbs, while another yielded only 166 lbs.

6. This table does not permit us to deduce any useful and precise generalisations of scientific value as regards the influence of altitude on the outturn of scented wood (heartwood), nor does it enable us to fix, with any shown of scientific accuracy, the yield of scented wood for each girth class, although it may justify a very rough estimate such as would serve for practical purposes of check and control over the work of indifferent and careless subordinates in exploiting the wood. The variation in the outturn is very great, not only between the different girth classes, but also in the individuals of the same girth class. In Mr. Lushington's opinion "figures of this sort only prove the immense variation of sandal *even when grown under similar conditions.*" The italics are mine. This, in other words, means that the sandal tree behaves differently from all other tree species, a proposition which it is difficult to accept unless and until it is established by further investigation and study. Mr. Lushington presumably assumes that the trees for which he has given figures of yield in each coupe were all grown under *similar conditions*. I do not know whether he has taken any account of the different species of trees associated with the sandal and their density in the coupes he refers to. It is hardly likely that he could have done so, considering the extremely irregular and patchy nature of sandal occurrence in unreserves and in the neighbourhood of villages and cultivation where the interference of man and beast with forest growth is so great, and where, therefore, it is impossible that all sandal trees felled could have grown up amidst congeners of similar species and density. If this were so, then it cannot be said that all the trees on whose outturn of heartwood Mr. Lushington bases his opinion were grown under "similar conditions." My belief is strong, nay, it is almost a conviction with me, that the influence of congeners on the growth and development of the sandal tree and on the production of scented wood is as great as the other conditions of growth such as soil, climate and altitude, which last may even be said to be secondary in its importance to that of the "congeners."

7. So far as the trees on whose yield the above table is based are concerned, I may say that the soil and the climatic conditions of growth were more or less similar, but in respect of congeners there has been considerable difference, and I attribute the great variation in the yield mainly to this difference. I base this statement on my general observations and nine years' experience of sandal on the Javadis.

8. The following inferences may be fairly drawn from the above table :—

(a) The natural sandal is mostly found at altitudes between 2,600 and 3,900 feet on the Javadis (Salem).

N. B. The area of sandal above 3,400 feet is very small.

(b) The average yield of scented wood increases as the girth increases, although not in any definite and fixed proportion.

In making this inference it is only fair to leave out of account abnormally large or small yield of some trees, as in the case of girth classes 31"—33," 34"—36," and 55"—57."

(c) Mature trees are mostly confined to girth classes 37"—39" to 46"—48," and the number of higher girth classes gradually diminish up to 60," above which the trees become too few to be taken into account in practical calculations.

(d) From the above it may be broadly stated that the maximum limit of girth of exploitable trees may be fixed at 5', the minimum being 3'. This holds good only to the Javadiis. Of course, dead, declining and damaged trees below this minimum must obviously be exploited, but they need not be reckoned with in making calculations for framing a working scheme for sandal.

(e) The influence of altitude on the outturn of scented wood in the several girth classes is not clear. The figures given by Mr. Lushington lead one to the same conclusion as regards sandal areas in Coimbatore also. But in the absence of reliable information as to the existence of similar conditions of growth, no comparison is possible, much less a generalisation.

9. As figures of yield of scented wood on the Chitteris, Melagiris and Kollimalais, as furnished by Range Officers are available, it may not be uninteresting to compare them with those of the Javadiis. The subjoined table exhibits them.



TABLE NO. II.  
*A comparative statement of the yield of scented wood of the several girth classes of sandal grown on the Javadi, Melagiris, Chitteris and Kollimalai Hills.*

LOCALITY.	JAVADI.		MELAGIRIS.		CHITTERIS.		KOLLIMALAI.		KOTADAI COUPE (NORTH COIMBATORE).	
Elevation.	2,500' to 3,000'.		2,800' to 4,000'.		2,800' to 3,700'.		3,000' to 4,200'.		About 4,000'.	
Girth class.	No. of trees.	Average yield in lbs.	No. of trees.	Average yield in lbs.	No. of trees.	Average yield in lbs.	No. of trees.	Average yield in lbs.	No. of trees.	Average yield in lbs.
	1902-03 and 1903-04		1901-02		1901-02		1900-01 and 1901-02			
16"-18"	2	61	14	33	5	42	...	2	25	17
18"-21"	...	...	34	67	14	61	...	29	25	37
22"-24"	1	84	17	78	39	74	...	16	25	69
25"-27"	4	126	12	77	11	86	...	8	25	103
28"-30"	8	147	19	103	26	130	...	28	25	180
31"-33"	5	89	11	161	11	144	...	16	25	296
34"-36"	2	647	11	136	6	195	...	12	25	...
37"-39"	108	299	3	176	2	270	...	5	25	...
40"-42"	73	318	1	...	4	296	...	1	25	...
43"-45"	47	393	...	...	1	247	...	2	25	...
46"-48"	24	529	...	...	...	...	...	...	25	...
49"-51"	8	659	...	...	...	...	...	...	25	...
52"-54"	6	578	...	...	...	...	...	...	25	...
55"-57"	6	699	...	...	...	...	...	...	25	...
58"-60"	6	496	...	...	...	...	...	...	25	...
61"-63"	1	...	...	...	...	...	...	...	25	...
64"-66"	3	...	...	...	...	...	...	...	25	...
67"-69"	1	...	...	...	...	...	...	...	25	...
70"-72"	...	...	...	...	...	...	...	...	25	...
73"-75"	...	821	...	...	...	...	...	...	25	...

N.B. - The figures for Coimbatore are taken from Mr. Lushington's Notes published in the January number of the "Forester."

10. A glance at this table shows that on the Javadis not only is the outturn of scented wood far and away the largest even as compared with the highest yield recorded for the Kotadai coupe of the north Coimbatore District, but also that the girth classes higher than 48" have been mainly confined to that range. From my personal knowledge of the sandal tracts of the Melagiris and Kollimalais, I must say that the sandal is growing on them in more open forests and is less efficiently protected from the mischief of man, both by way of lopping the crowns and damaging the bark. These causes coupled with differences in the conditions of growth such as rainfall, soil and climate, and probably also with inefficient supervision over coolies employed in squaring and cleaning the wood, account for the comparatively low yield of scented wood on these two hill ranges. Those who have not personally conducted and supervised the felling and cleaning of sandalwood can hardly realise the amount of wastage of heartwood caused by the hill tribes who are generally employed on the work partly through carelessness and indifference and in part deliberately to reduce the size of logs so that they may carry them down the hills with ease. Even on the Javadis the average outturn of heartwood prior to 1896 rarely exceeded 75 lbs. whatever the size of trees felled, though only trees above 30" girth had been ordered to be felled, but since that year the marking and felling have been conducted by Foresters and Deputy Rangers under the personal supervision of an Extra Assistant Conservator, who inspects and checks the majority of the trees marked annually.

11. In Mr. Lushington's classification girth classes differ from each other by 3" up to 24," and by 6" above that and below 36", while all above 36" are grouped into one class. This renders it impossible to ascertain the maximum girth attained by sandal in the Coimbatore sandal areas. Since the proportion of scented wood increases directly as the girth up to a certain limit, it is desirable to group the girth classes uniformly, so that each of them differs from the next higher or lower one by 3". This is all the more necessary, because it is one of our efficient means, if not the only one, of checking the outturn of wood collected under the supervision of subordinates who are not above temptation.

#### IV.— PROPORTION OF SCENTED WOOD TO THE TOTAL WEIGHT OF HEART WOOD-BEARING PARTS INCLUDING BARK AND SAPWOOD.

12. Taking advantage of the current official year's sandal fellings on the Javadis, I had such portions of the trunks, branches and roots of six sandal trees as contained heartwood weighed with bark and sapwood on, and after they were squared and cleaned, the heartwood alone was weighed separately.

The subjoined Table No. III shows the results.

TABLE NO. III.  
Showing percentage of scented wood by weight to the total weight of heartwood bearing portions of trunks, branches and roots with bark and sapwood on.

Serial number of tree.	TRUNKWOOD.			BRANCHWOOD.			ROOTWOOD.			TOTALS OF ALL PARTS.				PROPORTION OF SCENTED WOOD IN THE TRUNK, BRANCHES AND ROOTS TO THE TOTAL SCENTED WOOD			Remarks.					
	Locality.	Name.	Altitude.	Girths of standing trees at 4' from base.	Percentage of columns 5 and 6.			Percentage of columns 8 and 9.			Weight of scented wood soon after squaring and cleaning.	Weight with bark and sap.	Weight of scented wood soon after squaring and cleaning.	Weight with bark and sap.	Percentage of columns 11 and 12.	Trunk, branch and sapwood, together with bark and sap.		Scented wood of trunk, branch and rootwood, together.	Percentage of columns 14 and 15.	Percentage of col. 5 to col. 15.	Percentage of col. 9 to col. 15.	Percentage of col. 12 to col. 15.
					Weight with bark and sap immediately after felling.	Weight of scented wood soon after squaring and cleaning.	lbs.	Weight with bark and sap.	Weight of scented wood soon after squaring and cleaning.	lbs.												
1		Kambudgi.	3,600'	36"	1,267	398	31.66	656	141	22.52	400	191	47.75	2,283	780	31.97	64.5	19.3	26.3	19	15.	Percentage of col. 12 to col. 15.
2		Po. ...	3,600'	38"	1,626	476	29.29	705	170	24.11	390	225	57.70	2,720	871	32.02	64.7	19.5	23.8	19.5	23.8	Percentage of col. 12 to col. 15.
3		Do. ...	3,600'	40"	681	267	45.95	398	76	19.00	456	84	18.46	1,434	424	29.74	63.6	17.7	19.7	17.7	19.7	Percentage of col. 12 to col. 15.
4		Pudur.	3,000'	38"	800	419	40.44	110	17	15.45	106	48	45.71	1,115	483	43.31	86.5	3.5	10.0	3.5	10.0	Percentage of col. 12 to col. 15.
5		Do. ...	3,000'	37"	708	291	41.10	66	74	13.40	116	31	27.00	879	324	37.48	88.3	2.3	6.4	2.3	6.4	Percentage of col. 12 to col. 15.
6		Do. ...	3,000'	39"	498	109	41.97	164	60	15.34	106	37	35.71	867	287	33.10	73.8	14.1	13.1	14.1	13.1	Percentage of col. 12 to col. 15.
7																						These 2 grown amidst a fairly dense forest growth with Albizia odoratissima, Litsea zeylanica, Streblus asper, Cudrania, Acacia climbera &c. Growing in the open in a hedge about 20 yards from above 2 trees.

N. B.—For the purpose of this experiment the whole bole to its extreme top point up to which heartwood extended was taken as trunkwood, branchwood including only the actual lateral branches.

(a) Grown associated with Albizia odoratissima and Acacia climbera. (b) In a group of sandal trees with Acacia climbera, do. and pongamia glabra.

(c) Do.

13. The proportion of scented wood in the trunks of the first two trees was the lowest, while that in the branches and roots was the highest. These two trees were immature at the time of felling, and were growing vigorously on a rich deep ferruginous loam mixed with a few stones and associated with a fairly dense growth of trees and shrubs. The other four trees were growing in the open with comparatively fewer associates. Except No. 3 the other trees were at a much lower elevation. The proportion of scented wood in their trunks was the largest, and pretty constant too, but that in the branches and roots was much lower than in the first two trees and more variable. It is significant that the three trees grown at the lower elevation show a much larger percentage of scented wood in their trunks and much smaller percentage of it in the branches and roots than those grown at the higher elevation. This appears to confirm Mr. Lushington's observation that scented wood begins to form more quickly at lower elevations but to increase less as the girth of the tree becomes bigger.

14. It is worthy of attention that the two trees of 38" and 39" girth at the higher elevation gave a much larger outturn of scented wood than trees of similar girths at the lower elevation, but the 40" girth tree grown in the open at the higher elevation contained a much smaller quantity of scented wood than trees of smaller girths grown at the same or even lower elevation but with a larger number of congeners. Here there are two factors, *viz.* (1) difference of altitude and (2) difference in the number and variety of congeners. What influence these two factors jointly and severally exert on the outturn of scented wood it is difficult to say, although it may generally be affirmed that they do influence the development of scented wood. Judging from the figures in Table No. I, I am inclined to think that the number and variety of congeners exert a greater influence on the development of scented wood than does altitude. This view finds support in the smaller yield of tree No. 3 in the above Table No. III, if it is justifiable to take the yield of a single tree for making such a generalisation.

15. I was led to make the experiment of determining the outturn of scented wood in trunks, branches and roots separately because the heartwoods of the different parts of a sandal tree command different prices in the market, the trunkwood being of the highest value, sound branchwood coming next, and rootwood the lowest. In common practice, trunk and branchwood go together as billet wood, and rootwood stands by itself. From Table No III it will be seen that the percentage of scented rootwood varied from 20" to 26" at Kambugudi, while it was only 9" to 13" at Pudur.

16. Having thought it unsafe to rely entirely on the yield of these few trees, I have collected figures showing the percentage of scented rootwood to the total outturn of scented wood for a number of trees of each girth class from all the principal sandal-producing hill ranges of the Salem District.

The following table exhibits them in parallel lines to facilitate comparison :—

TABLE No. IV.  
Statement showing proportion of scented rootwood to the total outturn of scented wood in sandal on the principal sandal-producing hill ranges of the Salem District.

Girth classes.	SALEM JAVADIS.				MELAGNIS.				CHITTENIS.				KOLLIMALAIS.			
	No. of trees.	Average yield of heartwood includ- ing rootwood.	Average outturn of rootwood only.	Percentage of scented rootwood.	No. of trees.	Average outturn of scented wood includ- ing rootwood.	Outturn of scented rootwood on y.	Percentage of root- wood to total out- turn.	No. of trees.	Average total out- turn of scented wood.	Average outturn of scented root wood.	Percentage of root- wood to total out- turn.	No. of trees.	Average total out- turn of scented wood.	Average outturn of scented root wood.	Percentage of root- wood to total out- turn.
16"-18"	2	81	19	23.4	16	33	4	12.1	5	42	13	30.9	5	42	13	30.9
19"-21"	1	84	14	16.6	36	67	9	13.4	14	61	21	34.4	14	61	21	34.4
22"-24"	4	126	17	13.5	17	78	10	11.6	30	74	24	25.7	30	74	24	25.7
25"-27"	8	147	28	19.0	12	77	10	13.0	11	86	27	27.9	11	86	27	27.9
28"-30"	5	89	11	12.4	19	103	11	10.7	26	136	27	20.8	26	136	27	20.8
31"-33"	3	647	72	11.1	11	161	16	9.9	6	144	39	27.1	6	144	39	27.1
34"-36"	103	299	40	13.4	8	135	12	8.9	2	185	20	16.2	2	185	20	16.2
37"-39"	73	318	45	14.1	1	176	14	8.0	3	270	43	17.8	3	270	43	17.8
40"-42"	47	296	61	12.9	1	176	14	8.0	1	247	61	20.6	1	247	61	20.6
43"-45"	24	282	48	12.2	..	..	..	..	..	..	..	..	..	..	..	..
46"-48"	8	529	62	11.7	..	..	..	..	..	..	..	..	..	..	..	..
49"-51"	6	659	96	14.6	..	..	..	..	..	..	..	..	..	..	..	..
52"-54"	5	578	81	14.0	..	..	..	..	..	..	..	..	..	..	..	..
55"-57"	5	664	115	16.4	..	..	..	..	..	..	..	..	..	..	..	..
58"-60"	5	664	63	13.4	..	..	..	..	..	..	..	..	..	..	..	..
61"-63"	1	468	112	22.4	..	..	..	..	..	..	..	..	..	..	..	..
64"-66"	2	468	81	9.9	..	..	..	..	..	..	..	..	..	..	..	..
73"-75"	1	821	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Average	..	..	..	14.8	..	..	..	10.9	..	..	..	23.5	..	..	..	34.3
Percent- age.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

17. From the above table it is evident that the proportion of scented wood in roots to the total scented wood of a tree is lowest on the Melagiris, while it is highest on the Kollimalais. The Chitteris approximate the Kollimalais, whereas the Javadis approach the Melagiris in this respect. Even on the Javadis, trees grown at 3600' show a higher proportion of scented wood in roots than those of lower elevations, *vide* column 19 of Table No. III. At first sight, this leads one to suspect that the altitude influences largely the development of the scented wood in the roots of sandal; but I am not quite sure whether the depth and friability of and moisture in the soil do not play a more important part than the altitude. As far as I have seen, the soil at higher altitudes on the Javadis and Kollimalais are much deeper, more friable and humid with a smaller admixture of small stones than the soil at lower elevations, where it is generally much drier and more stony. The sandal tracts on the Melagiris have, roughly speaking, a much drier and more stony soil except on the plateau.

18. It may be inferred from Table No. IV, making due allowance for obvious abnormalities, *that the proportion of scented wood in the roots to that of a whole tree is fairly constant in a given locality with a small range of variation.* Thus, for instance, in the case of the Javadis, out of the 17 girth classes only in three did scented rootwood vary from 19 to 23·4 per cent, in two it was 16·5 per cent, and in all the rest it was between 10 and 14·6 per cent of the total scented wood. In the case of the Melagiris, the variation between all the girth classes was from 8 to 13·4 per cent. Out of the 10 girth classes on the Chitteris, in four it varied from 27·1 to 34·4, in three from 20·6 to 25·7, and in the rest from 14·4 to 17·8. On the Kollimalais, in six out of the seven girth classes it varied from 22·7 to 26·9 per cent, while in the remaining one it stood at 18·3 per cent.

19. I think it is also permissible to infer from these figures *that the proportion of scented rootwood to the total scented wood of a tree varies in different localities.* In the Salem District the average percentage may be fixed at 15 for the Javadis, 11 for the Melagiris and 24 for the Chitteris and Kollimalais.

#### V.—RATE OF GROWTH.

20. In dealing with the *rate of growth*, we must take it under two heads (a) *The Terminal or Height growth*, and (b) *The Lateral or Girth growth*. As far as I am aware, we have no reliable data under these heads. Mr. Lushington has given some useful information on the subject in his "Notes on the Sandal Tree in Southern India," but it is not complete and conclusive enough to be considered as definitely established. He has assumed each concentric ring to represent one year's growth, but whether it really represents one year's growth or not has not been clearly proved, and until such proof is forthcoming, this assumption must be held to rest on no scientific basis. There being no sandal plantations of different ages in the Salem District except the relics

of an old one started in 1873 in an open glade and abandoned in 1876, on the Melagiris, I am unable to furnish any reliable data of scientific value.

21. I have collected a few notes from ring countings on the Javadis, and though they may be too inadequate to draw final conclusions from, yet may suffice to compare with Mr. Lushington's figures. Of course, I assume, as Mr. Lushington has done, that each concentric ring represents a year's growth, there being no other alternative at present. In order that precise information may be gathered as to the height growth and girth growth separately, I arrange my scanty notes under these two heads in the hope that they will lead to further investigation and observation.

V. (A).—RATE OF TERMINAL OR HEIGHT GROWTH.

22. While camping at Chittoor on the Javadi plateau at an altitude of 3,200' in the latter part of February last, I had felled sandal trees from 3' to 21' in girth at 4' from the ground, and I measured the lengths of their boles, the heights up to which scented wood extended, the number of concentric rings, and other particulars.

The subjoined Table No. V. (A.) gives the particulars :—

TABLE NO. V. (A.)

Serial number of tree.	Girth at base.	Girth at 4' from base.	Height of bole.	Number of rings on radius.	IN THE BOLE.		Height up to which heart-wood extended up the bole.	Condition of heart-wood or degree of development of scent.	Weight of cleaned heart-wood in lbs.	Number of rings per inch of mean radius.	
					Diameter of wood at base.	Diameter of heart-wood at base.					
1	3½"	3"	7'	10	1"	...	...	...	...	20	These trees were growing on a pretty steep western slope about two furlongs below Chittoor at 3,100 feet, with the usual congeners such as Litsea, zeylanica, Acacia, Albizia odoratissima (sparse), Zizyphus, cinoplia, and Zylomyra, Scutia indica, Porumbol (Tamil), &c. Ground fairly well sheltered and cool. Soil fairly deep red loam with admixture of stones.
2	7"	6"	9'7"	14	2"	3"	8"	Incipient and scentless.	...	14	
3	12"	9"	15'	23	2½"	1½"	4"	Very faint scented.	½	13	
3	No. 3 at a height of 4' from base			15	2½"	...	...	...	...	13	
4	18"	12"	17'8"	26	5½"	2½"	6'9"	Faint scented	2'4	9	
4	At a height of 4' from base			17	3-½"	...	...	...	...	10	
5	18"	15"	16"	33	5½"	2½"	13'	Fairly scented.	14	11	
5	At a height of 4' from base			28	4½"	1½"	...	...	...	13	
5	Do. 13" do.			15	3"	...	...	...	...	10	
6	21"	18"	17"	33	6"	2½"	9'3"	Fairly scented	12'4	11	
6	At a height of 4' from base			26	4½"	...	...	...	...	11	
7	25½"	20½"	13'4"	37	7½"	4"	13'9"	Fairly good	36'3	10	
7	At a height of 4' from base			32	5½"	...	...	...	...	11	



It would be obviously unfair to draw any generalisations from the above table, as the figures under each girth are taken from only one tree. It will, however, serve to give a rough idea, a very rough one perhaps, of height attained at a given age, the height to which heartwood extends, and the weight of heartwood. In these trees there were hardly any branches owing to the pretty dense growth of other species amidst which they were growing, and hence also the great lengths of bole as compared with those given by Mr. Lushington on page 18 of his Notes already referred to.

23. Taking tree No. 4 and averages of Nos. 5 and 6 in the above table and comparing them with the averages of Mr. Lushington's No. IV, V, VIII and IX and of VI and VII, we find that a tree of 26 years on the Javadis develops about the same thickness of wood, but the formation of heartwood is slower, while height growth is greater; but in the case of trees 33 years old, Kylur trees show a distinctly greater development. This comparison is obviously inconclusive for the reason already stated.

24. As it is of importance to determine the height up to which workable heartwood extends in the stems, I may give figures of six other larger trees, three felled at Kambugudi at an altitude of 3,600 feet, and three at Pudur 3,000 feet. The following Table No. V. (B) shows the particulars :—

TABLE NO. V. (B.)  
*Showing heights or lengths up to which workable heartwood extended in the stems and branches of sandal trees on the Javadis.*

Serial number of trees.	Locality and altitude.	Girth of standing trees at base.	Girth of standing trees at 4' from base.	Stems (trunks).			Branches.												Remarks.													
				Length or height up to topmost point.	Girth at base.	Girth at top.	Branch No. 1.		Branch No. 2.		Branch No. 3.		Branch No. 4.		Branch No. 5.		Branch No. 6.			Branch No. 7.		Branch No. 8.		Branch No. 9.								
							Length.	Middle girth.	Length.	Middle girth.	Length.	Middle girth.	Length.	Middle girth.	Length.	Middle girth.	Length.	Middle girth.		Length.	Middle girth.	Length.	Middle girth.	Length.	Middle girth.	Length.	Middle girth.	Length.	Middle girth.			
1A	Pudur, 3,000 fms. Kambudai, altitude 2,500.	41"	39"	23' 3"	30"	7½"	9' 8"	11"	3' 6"	4"	3' 4"	6"	4' 2"	6"	5' 11"	9"	5' 10"	11"	5' 10"	...	6"	2' 6"	4½"	12"	5' 0"	6½"	5' 9"	4"	5' 1"	4"	50	The tree forked at the base into 4 stems.
B		28"	25"	20' 11"	17"	1"	5' 9"	10"	4' 9"	8"	8' 16"	6½"	6' 11"	14"	6' 4"	11"	5' 10"	11"	5' 10"	...	6"	2' 6"	4½"	12"	5' 0"	6½"	5' 9"	4"	5' 1"	4"	53	
C		21"	23"	9' 0"	14"	1"	5' 9"	10"	4' 9"	8"	8' 16"	6½"	6' 11"	14"	6' 4"	11"	5' 10"	11"	5' 10"	...	6"	2' 6"	4½"	12"	5' 0"	6½"	5' 9"	4"	5' 1"	4"	59	
D		21"	19"	7' 7"	14"	4½"	5' 9"	8"	6"	4"	3' 4"	6"	4' 2"	6"	5' 11"	9"	5' 10"	11"	5' 10"	...	6"	2' 6"	4½"	12"	5' 0"	6½"	5' 9"	4"	5' 1"	4"	59	
2		41"	38"	27' 7"	29"	3"	5' 10"	10"	4' 9"	8"	8' 16"	6½"	6' 11"	14"	6' 4"	11"	5' 10"	11"	5' 10"	...	6"	2' 6"	4½"	12"	5' 0"	6½"	5' 9"	4"	5' 1"	4"	59	
3		44"	40"	16' 8"	37"	4"	6' 4"	5"	3"	2'	13' 31' 0"	7½"	1' 11"	6"	2' 10"	5"	9' 8"	10"	5' 10"	...	6"	2' 6"	4½"	12"	5' 0"	6½"	5' 9"	4"	5' 1"	4"	59	
4	41"	38"	27' 4"	30½"	9"	3' 9"	8"	2' 11"	5"	1' 11"	5"	2' 10"	5"	2' 10"	5"	9' 8"	10"	5' 10"	...	6"	2' 6"	4½"	12"	5' 0"	6½"	5' 9"	4"	5' 1"	4"	59		
5	40"	37"	24' 9"	28"	5½"	5' 11"	5½"	1' 3"	4"	1' 11"	5"	2' 10"	5"	2' 10"	5"	9' 8"	10"	5' 10"	...	6"	2' 6"	4½"	12"	5' 0"	6½"	5' 9"	4"	5' 1"	4"	59		
6	41"	39"	2' 46"	31"	3"	3' 1"	6½"	6½"	3' 1"	7"	2' 2"	5"	2' 4"	8"	3' 4"	10"	5' 10"	11"	5' 10"	...	6"	2' 6"	4½"	12"	5' 0"	6½"	5' 9"	4"	5' 1"	4"	59	

Of the three trees grown at Kambugudi, the first two were amidst tall and fairly dense congeners, while the third tree was in an open hedge about 20 yards further off.

25. It is evident from the above table that sandal attains a good height on the Javadis and that workable heartwood in some cases extends even up to 40' in height. The figures are not those of the tallest trees, but may be said to represent the averages in the localities where they were found. Like other trees sandal attains its maximum height growth amidst tall and dense congeners, while in scrubs and open lands its average height rarely exceeds 20' from the base to the tip of its crown. This fact is well illustrated at Kambugudi itself, where we find the tallest trees—a few of them being more than 60' amidst *Albizia odoratissima*, *Diospyros montana*, *Litsea zeylonica*, *Acacia* climbers, &c, to the north of the village, while on an open and exposed slope about  $1\frac{1}{2}$  furlongs to the south of the above locality, there are hardly any trees above 20' in height. My observations all over the Salem District and at all elevations between 950' and 4,600' confirm this fact.

V. (B).—RATE OF LATERAL OR GIRTH GROWTH.

26. According to Table No. V. (A.) the lateral development of sandal is very slow in its early stages up to 23 years, and thereafter becomes more rapid. Taking the last three trees in that table, we find that the number of rings on an inch of *mean radius* varies between 10 and 11. Assuming that each ring represents a year's growth, we have a girth development of  $6\frac{1}{2}$ " inches in 10 or 11 years.

27. In 1896-97 I counted the rings on transverse sections of some sandal trees near Kambugudi (3,600') and Pudur (3,000'). I selected the broadest radius on each section and counted the rings thereon. The number of rings on an inch varied from 5 to 9 at Kambugudi and 8 to 12 at Pudur. In the former place the trees were growing on a rich deep soil associated with a number of congeners, while at the latter place they were in an open scrub jungle in an exposed and poor soil. Taking both together the average number of rings on an inch of the *broadest radius* was 8, or, in other words, the girth growth was  $6\frac{1}{2}$ " in every 8 years. As will be shown later on, this cannot be taken as a correct basis for practical calculations.

28. While supervising the exploitation of sandal trees in November last, I again counted the rings at Kambugudi and Palayapalayam (2,700'), and the result is recorded in the subjoined Table No. VI. I have shown in separate columns the average number of rings on an inch of the *mean radius* as well as on the *broadest radius*. In almost 90 per cent of the trees felled and examined by me I have found the rings very irregular and wavy, and hence I think it incorrect to take the number of rings found on the *broadest radius* as representing the actual growth. The actual and true growth must be taken as that represented by the mean radius or diameter, and that this is so is confirmed by the appreciable differences between the figures in columns 6 and 8 of the table:—

TABLE NO VI.

Serial number of trees.	Girth.	Average radial thickness of bark.	MEAN RADIUS OF WOOD.			BROADEST RADIUS.		Locality and altitude.	Remarks.
			Length.	Member of rings on ½ an inch.	Average number of rings on ½ an inch.	Length.	Average number of rings on an inch.		
1	2	3	4	5	6	7	8	9	10
1	18½"	¼"	2½"	31	11	3½"	9	Kambugudi 3,600'	Transverse section of a branch.
2	21½"	¼"	3½"	38	12	4"	9	Ditto	Ditto.
3	21½"	¼"	3½"	25	8	3½"	8	Ditto	A forked branch at base of section.
4	37½"	¼"	5½"	43	8	7½"	6	Ditto	At a height of 5' from base.
5	35"	¼"	5½"	46	9	5½"	9	Ditto	Ditto 4'10" ditto.
6	26½"	¼"	4"	36	9	3½"	9	Ditto	Ditto 7'11" ditto Top section of No. 5.
7	10"	¼"	1½"	15	11	1½"	10	Ditto	A top branch of Nos. 5' and 6 at a height of 17' from base.
8	30"	¼"	4½"	50	11	5"	10	Ditto.	
9	36"	⅛"	5½"	46	9	5½"	9	Palayapalayam 2,700'.	At a height of 5½' from base.
				Average	10		88		

From this table we see that for every increase of 2" in diameter, that is,  $6\frac{1}{2}$ " in girth calculated on the *mean radius*, sandal requires 10 years, whereas if the rings on the broadest radius be taken as the basis, it would require only 8.8 years. This difference, though small at first sight, would in the case of trees of, say, 36" in girth (11.4" diameter), amount to 7 years, and this in my opinion is not a negligible period. I take 36" girth as the minimum exploitable size of sandal, because trees below that girth may reasonably be taken as immature on the Javadis, *vide* Table No. I *supra*.

29. Mr. P. M. Lushington found  $6\frac{1}{2}$  to  $7\frac{1}{2}$  rings per inch of radius in the Bhavani Taluk, *vide* page 17 of his "Notes on Sandal in Southern India," and on this basis he calculates that exploitable trees of 32" in girth would be about 40 years old. Comparing his figures with those noted in the foregoing paragraphs, we arrive at the alternative conclusion that either the sandal grows in the Bhavani Taluk more rapidly than on the Javadis, or he must have counted the rings on the broadest radius. If the latter were the case, his data would be obviously unsuitable for practical calculations, as they would represent the growth of sandal to be much faster than it would really be. Mr. Gamble says in his "Manual" (page 586) on the authority of "Kad-Handi" who, I believe, is Mr. D. E. Hutchins, late of Mysore and now of the Cape Colony, that "Old trees in Mysore were found to give an average of 9.2 rings." This is a nearer approach to the rate of growth on the Javadis than Mr. Lushington's figures.

30. I am inclined to take the rate of girth growth of sandal at  $6\frac{1}{2}$ " in 10 years, as the average number of rings per inch of *mean radius* is found to be 10 on the Javadis. While admitting that the rate of growth varies in different localities according to variations in the conditions of growth, I am inclined to believe that the *average rate of growth* even in the Bhavani Taluk may be found to be somewhat lower than that given by Mr. Lushington if the rings are counted on the mean radius deduced from girth which appears to me to be the correct method.

31. A glance at Table No. I shows that while the *maximum* girth attainable by sandal on the Javadis has been as high as  $6\frac{1}{2}$ ' in one isolated instance, trees between 4' and 5' girth are not rare, while those below 4' and above 3' are quite common. The yield of scented wood of each girth class given in that table justifies the statement that the outturn of scented wood is in direct proportion to the girth of a tree up to a limit of 5' notwithstanding large variations in some cases; these latter may reasonably be treated as abnormal. In the light of this fact I should have no hesitation in fixing 36" as the minimum girth of exploitable trees at any rate on the Javadis. To attain this size, a tree requires 57 years, assuming that in 10 years it increases in girth by  $6\frac{1}{2}$  inches or 0.63 inches of girth every year, as

deduced from Table No. VI *supra*. I purpose to deal with the question of Commercial Exploitability of sandal on a future occasion.

(To be continued.)

SALEM, 29th March 1904.

M. RAMA RAO.

## II.—CORRESPONDENCE.

### The Training of Indian Forest Officers.

With reference to some remarks made on this subject in the March number of the *Indian Forester* on the candidates being trained in India for the Forest Service, I am writing to give some arguments in favour of the establishment of a Forest School in Southern India.

The total number of the Lower Controlling Staff and Rangers is at present about 600, which must be quite insufficient for the executive work of the Forest Department. As there are 211 members of the Upper Controlling Staff and about 100 Extra Deputy and Extra Assistant Conservators of Forests, of whom 27 include the Inspector-General, the Conservators of Forests and certain special appointments, this leaves 284 other appointments. Of these, if we allow for 28 men on leave and 16 for working plans, there must be about 240 divisional and sub-divisional charges. The number of rangers is only 500, or about two for each division and sub-division. Now when I was in charge of the School Circle in 1889, there were 13 rangers for three divisions containing 780 square miles of forest, or one ranger for 60 square miles, and that was by no means too light a charge for a ranger. In 1900 there were 81,000 square miles of reserved forests in British India, to say nothing of the 9,000 square miles of protected forest and the 27,000 square miles of unclassified forests. If we consider the 81,000 square miles of reserved forests alone, although the other areas must need some form of protection, and the areas of reserved forests are steadily increasing in area, this would require 1,350 rangers, at 60 square miles each, which may be made up to 1,450 allowing for men on leave. In Mr. Ribbentrop's "Forestry in British India," published in 1900, it is stated that 20 per cent of the Upper Controlling appointments are to be held by the Provincial service which is trained in India; this with the 20 men already accounted for will bring the number of these appointments up to 140. The total number of men now required for the Lower Controlling and Executive Staffs is therefore about 1,600. I do not know how many trained men are required for the Forest Departments of the Native States, but perhaps the Editor could give these in a foot-note. It appears to me, however, that 400 cannot be an excessive estimate, so that at present about 2,000 trained officers are required for India alone.

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We have no means of ascertaining the requirements of Native States but we know at present of about a dozen trained Rangers who have not succeeded in finding employment—HON. EDITOR.

The French Government has obtained permission to have their Forest officers for Tonquin and Cochin China trained at Dehra Dun, and so has the Crown Colony of Ceylon, whilst the Government of India has supplied men for Siam. I leave out the numbers of these men, and assume that 2,000 men are all that are required at present.

This means an annual recruitment of about 100 men, and as the Dehra Dun course involves two years' residence there, this means 200 students. Such a number cannot possibly be dealt with at Dehra; they could not be given sufficient practical work in the Forests of the School Circle during the annual five months' work in the Plains Forests, nor could they be accommodated in the hills Forests, during the month's tour there. There must be considerable difficulty already in dealing with fifty students every year at Dehra. I was also recently informed that the Dehra Dun authorities could not admit some Forest students from Mysore on account of want of accommodation, and this led me to imagine that the future inevitable pressure had already begun.

Dehra Dun, besides its excellent English course for Rangers, has also a vernacular course in Hindustani for students who are ignorant of English, and from the benefits of this Hindustani course students from S. India, who speak other languages, are necessarily excluded. Experience in India has, however, shown that many men who do not know English may become excellent Forest Rangers.

From the above considerations it appears that the time has come for the Government of India to consider the advisability of establishing a Forest School in S. India on the same lines as Dehra Dun. It is quite true that a Forest school has been established in Burma, and is to be enlarged, but I maintain that Dehra cannot deal with more than fifty students annually, and would probably train thirty more satisfactorily than fifty. There must also necessarily be at every school some men who fail to obtain certificates, and this would increase the numbers under training. Hence there is ample necessity for a school in S. India as well as in Burma, and at each of these schools a vernacular class will be required for foresters, with subsequent promotion to rangerships, as well as an English class for the Lower Controlling Staff and for rangers.

The only way in which these schools have been dispensed with, up to the present time, must be by the appointment of untrained men to rangerships; this can only be an evil, now that Forest work in India is becoming more like that in Europe, where executive charges are much smaller than they usually are in India.

I have not before me all the data for an accurate list of the numbers of Forest divisions, sub-divisions and rangerships in India, so that I hope that one of your readers will kindly deal with this subject, including Native States, and place before us an exact account of the present state of things, showing the distribution of

the Lower Controlling Staff and of the Executive Staff, the present areas of rangerships and the number of untrained men holding rangerships.

As regards the concluding paragraph of the paper referred to above, that "the general principles of silviculture are the same for every country and the practical application of these principles must be learned *in situ*," I will only state that forestry being a practical subject, its study, especially for executive officers, should as nearly as possible correspond with the actual work which the men will have to carry out. While, therefore, I do not deny that Southern Indian Forest students must greatly benefit by their Dehra Dun course, I maintain that they would study better in the forests of their own climatic zones, provided that a school equally well equipped as that of Dehra Dun were available.

COOPERS HILL, *March*.

W. R. FISHER.

We understand Mr. Fisher now bases his necessity for another Forest School on the very problematic event of their being at some future date an establishment in India of some 2,000 trained rangers. We think it sufficient to deal with the requirements of the present day and the near future. Perhaps also Mr. Fisher is not aware that in Southern India a ranger who does not know English is almost unknown, and such a man would never be made a ranger now-a-days. Nor is there any necessity for it where the knowledge of English is so widespread that many guards, and even syces, can talk it. Instruction in the vernacular in Madras would be a matter of some difficulty, as there are no less than six official vernacular languages. Even in Northern India 75 per cent of the vernacular class at Dehra Dun Forest School can and do speak English, and the absence of any necessity for vernacular classes is becoming so marked that we should be glad if they were done away with altogether.

—HON. EDITOR

### The Flowering of *Dendrocalamus Strictus*.

THE Myinwa Bamboo (*D. strictus*) has this year flowered fairly extensively in the Ruby Mines District, but not generally over the whole Forest Division; for instance, one can travel through large areas of this bamboo forest and not find one flowered stem, and again through others with only a clump flowered here and there. Roughly, the area over which the flowering has taken place is east of the Irrawaddy River and to the south of the Division, namely, that portion adjoining the Mandalay Division. Now I have noticed two curious facts in connection with this flowering. Firstly, that the flowering is seemingly affected by situation, that is to say, the bamboos on the most exposed situations and the hottest localities have flowered, while those in sheltered and cooler areas have not done so. Thus the *D. strictus* bordering sandy creeks, on exposed ridges, along the edge of *Indaing*, round paddy fields, old *yas*, and generally in flat village excluded areas, have flowered, while the rest inside the reserves remain green.

Now this at once leads one to ask the question, will the same thing happen when *B. polymorpha* flowers? Or will that bamboo flower in one gigantic mass wherever it grows in Upper Burma?



Again, will the rest of the *D. strictus* flower next year? It will be interesting to see whether it does or not. I should also mention here that *Thanatwa* (*B. oliveri*) has also this year flowered sporadically often when growing near *Myin*; but not to any considerable extent. I have also noticed *D. hameltonii* in flower in a good many places.

The second point noticed was that the red jungle fowl, wherever the *myin* has flowered extensively swarmed; this is not to be wondered at considering the immense quantity of food available in the shape of bamboo seed; but now comes the curious point. The hens were all accompanied by chickens as early as February. I am certain of this, as on February the 14th I shot a chicken (to make sure); this chicken was one of a brood following a hen and was fully fledged, and was therefore quite three weeks old; since then I have seen numerous broods of all ages following their clucking mothers.

Now the usual season for the red jungle fowl to be sitting is (from my experience) the month of April, after the first jungle fires have been over the ground, as often, when out at work or shooting in April, I have found nests with fresh eggs. That I am correct is upheld by the fact that in the new Forest Rules the close time for jungle fowl is fixed as from March 1st to August 31st. It is evident the plethora of food for chickens has induced the jungle fowl to commence sitting and hatching at least two months earlier than usual. This is a most interesting fact, and I think deserves to be recorded.

C. W. A. BRUCE, F.I.S.,  
D.C.F., Ruby Mines.

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### The Assam Forest Report for 1901-02.

In the *Indian Forester* for the month of January 1904 I observe a reply by Mr. C. P. Fischer to a note by you remarking on the preparation of the Damhu Working Plan. As a Forest officer in Assam, I am glad to say that I am in a position to endorse and uphold all Mr. Fischer remarks therein.

Last working season the sawing of sal metre-gauge sleepers for the Dhubri-Gauhati Extension of the Eastern Bengal Railway was commenced. No sawyers whatever are procurable locally; hence men had to be recruited in the Darjeeling district, and have been kept at work in the pestilential climate of this forest with great difficulty. There have been frequent desertions and loss by death. Nevertheless I am glad to say that over 14,000 sleepers of the 15,000 contracted for have been sawn up to date, and there is every reason to hope that, not only will the balance be forthcoming by the end of the present working season, but about 900 special sleepers, which have been ordered by the above Railway Company, will also be ready by that time. The

Damhu-Damra road was laid out before the Damhu Working Plan was under preparation, and over this three contractors subsequently extracted produce with difficulty owing to, as I may remark by the way, the severe gradients of one part of the road where it rises about a 1,000 feet in less than half a mile. It is, however, now under contemplation to lay a new alignment, and this will, I hope, remedy matters. The sleepers have to be carried 37 miles by cart to Dolgoma Ghat on the Brahmaputra river; and thence by steamer flat to Dhubri, a further distance of 74 miles, with the alternative to float from Damra, which is 24 miles from Damhu, direct to Dhubri, during the rains when the Dudnai stream is in flood. This, of course, would be the cheaper mode of transport. Dhubri affords the only market for our timber at present.

The rate of sawing is annas 10 per metre-gauge sleeper, and it costs 6 pies per sleeper for collecting at road side. The carting is done at 11 annas 6 pies per sleeper to Dolgoma Ghat, with a further cost of handling these at 6 pies per sleeper. Thence the Steam Navigation Company charge 2 annas per sleeper, with an additional cost of 6 pies per sleeper for stacking at Dhubri. Only trees of 6 feet in girth and over are being felled; and on an average yield 20 sleepers, or about 30 cubic feet of converted timber per tree. Unfortunately with the present difficulties of labour and transport a far bigger percentage of unconverted timber has to be considered as waste, which might otherwise be made to add at least another 25 per cent to the revenue of the forest. It will be observed that each sleeper landed at Dhubri costs us one rupee and nine annas, and the railway pays us at rupees two and annas two per sleeper. This, casually observed, may appear to leave a good margin for profit. But this must be balanced by the cost of the repairs and up-keep of the cart road and the initial outlay in saws and implements, &c.

Locally little or no labour is procurable, the inhabitants of the Garo Hills being too well off to work for wages, notwithstanding that annas 5 and 4 pies or a rupee per coolie for 3 days—a liberal wage—is offered.

The above figures hold good for the operations in Damhu only. When the next forest reserve, which lies further in the interior, about 10 miles by road, comes to be worked, the sawing and transport charges will have to be enhanced at least 5 annas per sleeper, and this will mean that little, if any, profit will accrue to the Department.

A FOREST OFFICER IN ASSAM.

## IV.—REVIEWS.

**Ilm-us-Sahra.**

*Ilm-us-sahra*, or a treatise on Sylviculture, by Moulvie Amed Mohi-ud-din, Superintendent of the Local Forest School, Hyderabad, Deccan.

This book has been written for the use of the local Forest School, Hyderabad. It is based on Mr. Fernandez's "Manual of Sylviculture," although it is in a very much abridged form. Nearly all the main heads of Sylviculture have been touched, but the parts devoted to grazing and fire protection have been more fully dealt with. This seems a departure in the right direction, for protection is undoubtedly the chief problem in the Forest Administration of H. H. the Nizam's Dominions.

The author has done a useful work in supplying Persian or Arabic synonyms for technical English words, although objection might be taken to some of them, either because they are not correct or because they are too unweildy for every-day use. For instance the Arabic word *sahra* signifies a desert. It is therefore not correct to use it for forest and then to coin compounds like *Ilm-us-sahra* to denote *sylviculture* and *sahra i'ula* for *high forest*, and so forth. The Great Sahara Desert, which derives its name from the same Arabic word, is quite the reverse of that to which the term forest is applied, at any rate of that which it is the aim of Sylviculture to rear and maintain.

For *habitat* the author gives us *fitarti-jay-raidayesh*, which is more a definition than a synonym. The simple word *watan* would perhaps be much better. Similarly, we are given *raqha-gata'-burid shadni* for *coupe*. For every-day use the English word *coupe* is immeasurably better than a long string of the above kind. *Qata'-buridan* is more of the nature of a clipping than of a felling. The definition of *coupe* as given in the book is also defective, for a *coupe* is not simply an area where fellings are to be made. Similarly objectionable are *'urug-ul-ussul* for *rootsucker* and *adh-hanu-podu* for *embryo*.

No illustrations have been given excepting in the chapter on fire protection, where a few parallel lines inadequately represent fire traces.

The above defects are pointed out in the hope that Moulvie Ahmed Mohi-ud-din will perhaps think it fit to effect improvements on the lines indicated in a subsequent edition.

The book is the first of its kind in the Urdu language, and much credit is due to the author, a passed student of the Imperial Forest School, for having undertaken it. We have no doubt that it will in a way fulfil the object with which it has been published.





**A TIMBER ROADWAY.**



**DECIDUOUS FOREST OF THE APPALACHIAN MOUNTAINS.**

## V.—SHIKAR AND TRAVEL.

**The Long Round to England.**

## PART II.—THE NEW WORLD.

*Geographical Position.*—The voyage from Colombo to Japan is a coasting voyage along the edge of Far Eastern Asia. It takes about twenty days by the faster vessels. Interesting glimpses of what lies behind on the mainland are obtained by the stoppages at the chief ports, and the traveller's attention is kept as much on the land as on the sea. The passages across the oceans which separate the Old World from the New carry with them a *new* experience. That from Yokohama to San Francisco lasts eighteen days, with one stop at Honolulu, and that from Quebec to Liverpool eight and a half days, of which six clear days are spent at sea. Except close to land we saw less than a dozen vessels in those six and twenty days. The feeling of isolation from the rest of the world and of dependence on one's shipmates, temporary though it is, is very complete, and a deep impression is received of the immensity of the ocean and the boundless wastes of water.

And—to compare big things with small—there can be no doubt that this same influence of the oceans operates in a very real and lasting manner on the history and development of the New World, and of the great new nations which are growing up in it. No one who has not crossed these or other similar great oceans can realise by how much the Old and New Worlds are divided. Individuals may cross with ease, but nations hardly. No greater contrast in civilizations could be obtained than is afforded by the journey across the Pacific—at one end the ancient culture and customs of India and the Chinese, from whom also the Japanese derived their old religion and customs, and at the other the most progressive elements of western civilization, engaged in the race for material wealth in the Far Western States of North America.

*Development of North America.*—The New World is a new world indeed. Discovered, or re-discovered, four centuries ago, it is only in the last hundred years that great strides have been made in the development of North America. These have all proceeded from the east of that continent. In the case of the United States, the thirteen original states were federated in 1781, almost at the end of the War of Independence. Extending from the Atlantic to the Mississippi River, they comprise less than one-third of the area of this vast confederation. The whole of the remainder, consisting of the boundless prairies, now the wheat-fields and grazing grounds of the West, and of the mountainous region with fertile valleys and the dry belt of the Rockies and the Far West, were acquired by discovery, or bought from or ceded by France, Spain and Mexico in the first half of the nineteenth century. The development of Canada has been on the same lines, but has proceeded more slowly. For one thing the great stream of

emigrants escaping from real or imaginary tyrannies, and at any rate in most cases from very real poverty in the old countries of Europe, naturally turned their eyes towards the great wealthy new country with a new constitution on the most democratic lines, called The Land of the Free, rather than to the new country to the North with the Old World constitution. Secondly, Canada has laboured under the disadvantage of a reputation for an extremely cold climate, as exemplified in the title "Our Lady of the Snows."

*Climate and Physical Features.*—This pretty name hardly gives a correct idea of the conditions which, as in the United States, are mainly continental with great extremes of heat and cold. The areas of Canada and of the United States (with Alaska) are nearly equal, and each approximately the same as that of Europe. In the case of Canada, it is of course true that arctic conditions prevail over the northern portion of the country, but probably nearly one half, or even more, of the whole area is good *productive* land either for agriculture or forest, and suitable for Europeans. Of the United States, the South-Western States are too hot for the full meed of out-door labour by whites of European extraction, while the negroes are very numerous in them; the South-Eastern States contain a considerable proportion of arid land. Thus the area suited to white out-door labour in the U. S. is not very much larger than that in Canada though the total amount of cultivable land is much greater. The Canadians claim that, owing to a fortunate bend to the north of the Isothermal line, the area in their territories of the middle west, suited for wheat growing, is equal to that south of the boundary line in the United States. Be this as it may, the former is far larger than was formerly supposed, being about seven hundred miles in extreme length from north to south. The above explanation is due to Canada, because the capacity of the country has been greatly under estimated in the past. To repeat,—the climate of N. America, generally speaking, is of the usual continental type. With the short, quick summer season the wheat, even in Ontario, is cut a month earlier than in England. The damp heat of New York in July is unpleasant even to an Anglo-Indian; but certainly this is partly on account of the lack of suitable means of combating it. The rainfall, except in the Middle West and South-Eastern States of the U. S., is sufficient or abundant, the latter particularly on the Pacific Coast, where also the extremes of temperature are less marked. The physical features of the continent are enormous and very striking even to a traveller from such a large-featured country as India, except in the height of the mountain ranges. In crossing from the west to the east the great width of the physical formations, the mountain ranges of the Far West, the prairies and wheat lands of the Middle West, and the flat or undulating ground of the more highly-developed and older states of the east, make the journey a little monotonous, but this same fact undoubtedly makes for the greater wealth of the country and

increases the tendency to conduct agricultural and industrial enterprises on a large scale. The natural wealth, then, both of Canada and of the United States is immense, and hardly conceivable by those who have only visited the countries of the eastern hemisphere.

*Social and Political State.*—Let us consider now very briefly indeed another of the main heads which make up the life of a nation, the social and political state of the people of each country. To an Anglo-Indian no point of the journey is more interesting than the consideration of the Government and its mutual relations with the social state in each of India, Japan, the United States and Canada. In the first the comparatively new civilization of Western Europe has been grafted on to the ancient culture of the East by the force of conquering arm, and the ancient tree, strengthened though it is, shows on itself comparatively little signs of the change in its stubborn constitution. In India the population is almost entirely agricultural, and to hold a bit of land is a universal ambition.

In Japan the population is also mainly on the land, but a people of an older civilization but quicker disposition has recently, with extreme rapidity and by its own agents, led by its upper oligarchic classes, taken for its own so much of Western arts and the latest methods of government as seemed to it desirable. How different is the case with the great North American confederations. The Western European standards of government and of social condition which, as adopted in present-day Japan, mark so great an advance on the former constitution, appear, when brought into consideration in North America, rather dull and slow and antiquated. And yet it is not 150 years since the English colonists of the thirteen states shook off the yoke of the English Crown, while the northern provinces, Canada, mainly peopled with colonists of French extraction, remained loyal to the same. If it is their conservatism\* which chiefly caused the latter to remain constant to our Empire, it is certainly due to conservatism and the conservative form of Government, as well as to misapprehensions about the wealth and climate of Canada, that her development has been so slow.

This same conservatism, however, could only keep Canada back so long as the long line of immigrants continues to turn its steps more to the Southern confederation on account of the advantages conferred on them by the more democratic Government with its consequent somewhat smaller distinctions between class and class in social life. With the balance of power between the conservative old inhabitants of Canada and the progressives with the new comers constantly altering now in favour of the latter, that time is coming to an end.

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\* In many of the villages of the Province of Quebec no English is spoken, and many of the French representatives when they first go into Parliament are unable to speak, as English is the language of the Houses.



Both confederations, then, are being continuously developed, in both the exploitation of their natural resources is the chief aim and object of the people. Both are practically safe from external attack, and external affairs as contrasted with internal affairs appear of remarkably small importance, especially in the U. S., to the vast majority of the population, and no wonder, for even though the U. S. contains already about eighty million inhabitants, there is said to be room, in a country of immense wealth as well as size, for nearly eight times that number. How great, then, may be our expectations for Canada, how little our surprise that they already look forward to the time when they will be able to cherish and protect the mother country as she has in time past cherished and protected them.

Leaving aside the negro question, social conditions in both countries are almost the same. The differences in the national life are thus essentially political.

The separation of the United States from England was due to a display of arbitrary power by the latter. The aim and natural result of success in the War of Independence was the creation of a democracy, the abolition of class Government and the establishment of equal rights for each member of the nation. Under the democracy the federated states are responsible to themselves for their own internal working, and are to that extent self-governing, but matters affecting other states or the country as a whole are dealt with by the Federal Government. This system, in practice as well as in the theory, is eminently suited to the development of a wealthy country of virgin soil which is relatively completely safe from external aggression. The decentralisation of Government and freedom and power to progress of *each individual*, though they have already been the cause of one of the greatest civil wars known in history, have also been the main factors in the unexampled development of the country, and this latter is the direct off-spring of the American character of energy and powers of organization, working under and fostered by the particular conditions named above and by immense natural resources. Character and country have developed mutually, and, we may say, exuberantly, and the tendency of these later years is that wealth, of which there is enough for all, is obtained and kept with difficulty owing to the unscrupulousness and over-keenness of a few to obtain an undue portion. This is the undoing of the ideals of the democracy, and, in addition to being a bad example, because often successful, leads to much bitterness and strife between capital and labour. The more central and permanent Government of Canada, while it makes far slower development, appears to have more ballast, and exercises a better and more lasting effect on the social system.

Canada in its combined political and social state is placed in a curious intermediate position between England and the States; it is a democracy under monarchical influence.

*Effect of the above on the Forest question in the United States.*—The above very imperfect sketch has been given here so that readers of the *Indian Forester* may understand rather more clearly the conditions and difficulties which have to be faced in the evolution and working out of a forest policy for both the States and Canada. The interest of the journey lies as much in the study of these problems as in the inspection of the very varied silvicultural conditions in the two countries. The systems of forestry may be, and are, universal, but the methods of introducing a forest policy vary proportionately with the states of society in different countries. The instances of scientific forestry, including the establishment of State forests, being introduced by other forms of Government are numerous, but the writer is probably right in saying that in no other case has the thing been done on a large scale by a republic, except in North America. With the enormous development that has occurred there during the last century, and with seemingly inexhaustible wood supplies, both the boundaries of the forests had to be pushed back by settlers, whose only desire was to get rid of the tree growth, and the rich supplies of timber were most wastefully exploited by those who knew their value and had the means and brains to work them out. With such supplies and under such conditions of Government an enormous waste was inevitable. To those who objected the settlers had a ready and reasonable reply, and lumbermen, who turned the timber into money, had, and still have, the means to stifle discussion and awkward questions. Much of the timber-wealth of both the States and Canada was obliged to be removed to make way for cereals. What proportion of the soil is to be retained under each of these classes of crops in the future is no doubt still unsettled, but the comparatively easy acquirement of great fortunes in the lumber-industry and of the influence which they carry and the serious depletion of timber stocks brought the matter to an acute stage a few years ago.

*Forests in the Far Western States and their Treatment.*—And here we may turn aside from the abstract discussion to recollect some of the forests we passed through in the Far Western States of California, Oregon and Washington. A short excursion into the country of the Red-wood (*Sequoia sempervirens*) to the Upper Basin National Park south of San Francisco, confirmed the opinions, expressed by knowledgeable men interested in the forest question who were met with in that city, that the Sequoia forests, which originally formed a principal part of the forests of California, are being rapidly exhausted. The State and Federal Governments, which have already put their heads together and created several large National Parks and Forest Reserves, are again considering the question with a view to still further large reservations, for with the denudation of the slopes of the Sierra Nevada and Coast ranges, the diminution of the water-supply for irrigation purposes

in the rich Californian valleys, where an artificial supply of water is essential, already gives ample promise of becoming serious. Again, to any forester the railway journey northwards from San Francisco through Portland and onwards east across the Cascade and Rocky Mountains by the Northern Pacific Railway must be of the greatest interest, especially when it is varied by a trip to a lumber camp in full working order. In all the forest seen until the Cascade Range had been crossed, the principal species is or has been Douglas fir (*Pseudotsuga taxifolia*) and the chief accessory species white hemlock (*Tsuga heterophylla*). Red cedar (*Thuja plicata*), spruce and balsam spp, as well as pines. The sugar pine (*P. lambertiana*) was not seen. On the western slopes of the Rockies interesting mixed forests of larch (*L. occidentalis*) and the above mentioned species are seen from the N.P. Railway. These all belong to the *Coast Province of the Pacific Forest District*,\* the area with the most luxuriant temperate forest growth on the face of the earth. The almost pure forests of Lodgepole pine (*P. murrayana*) in the Yellowstone Park have less interest owing to their poor quality at the high elevations of 6,000 feet and over. They belong to the *Interior Province of the Pacific Coast District*,\* in which the rainfall is slight.

The present value of all these forest areas, from those of the Redwood onwards, must be considered from certain stand-points. All forest land within reach of the railway, and much of that at a distance, has been lumbered over and a great part burnt, not once or twice but often. Thus their climatic value as reservoirs for the rainfall has been in great part destroyed. Similarly their intrinsic commercial value is largely a thing of the past, for over large areas "burns" have been so bad that there is nothing underneath the sparse old stock (half of it dead standing timber) but some scattered young growth with a tangle of bushes. There are, however, other larger areas, even close to the railway track, in which, though the valuable species among the older classes were mostly cut out, enough were left to seed the ground partially or in some areas completely. The forest will have been burnt over at least once or twice since lumbering, to clear the waste material, and since then it has happily escaped conflagration. Needless to say there has been no sylvicultural intention in such firing. The resulting reproduction however is in some cases of the very best quality. Some striking instances of this are seen in crossing the Cascade Range, when beautiful young mixed Douglas fir forest alternates with some terrible burns in which there may be hardly a living stick on a big mountain slope. In the virgin Douglas fir forest, the surface is very damp, and the only reproduction seen is that of hemlock, growing often on dead fallen logs. On the whole, then, while the ruthless methodical destruction

\* C. S. Sargent, quoted in W. R. Fisher's translation of Schimper's "Plant Geography."

over large areas is a sad sight for a forester, and indeed for all persons with any economical instinct, there are other large areas which retain their value as commercial assets for the future, and which, if not kept by private owners as forest or converted into agricultural land, are well suited to form part of the State forest reserves.

Again, further from the markets and the main tracks of railway, there still remain large areas of untouched virgin forest. The writer had the good fortune to visit one of the camps of the St. Paul and Tacoma Lumber Company on the lowest slopes of the Cascade Mountains near Mount Rainier. The Company has bought about 80,000 acres, and is one of the largest among twenty-five or thirty others in and round Tacoma, which divide five or six million acres between them. It must be explained, for the benefit of those who are not aware of it, that for the purpose of their development the whole of the Western States were by degrees divided up on the map and on the ground into sections, each of one square mile, and quarter sections of 160 acres. These have been gradually opened to settlement and allotted at a nominal price, but it is understood only one quarter section is allotted to each settler. It is not difficult to get round the intention of the statute, and companies are formed for lumbering with many thousand acres. The company which had the enterprise to build the Northern Pacific Railway from Lake Superior to the Pacific about 25 years ago obtained a free grant of the alternate sections on a width of 80 miles along the line. Thus fortunes may be made. In the case of the particular lumber company cited above, certain of the sections composing the area were bought from the railway company and a considerable portion of the remainder was acquired at  $2\frac{1}{2}$  dollars per acre. The land with timber on it is worth about 8 to 10 dollars per acre, but a big sawmill plant must be erected, which has been done in this case at Tacoma, about 25 miles from the forest, and the cost of exploiting the timber to the mill is considerable. We were informed that land at  $2\frac{1}{2}$  dollars per acre would give 10,000 to 20,000 board feet sawn timber. The best portion of the evenly stocked forest seen contained a *very large* stand, the trees all of 400 to 500 years old, averaging quite 200 feet in height with diameter growth up to 8 feet. The forest was mainly composed of Douglas fir, and the biggest tree the Superintendent, a Canadian Scotchman, had seen was quite 300 feet long, being 197 feet to the first branch! With annual cuttings of 2,000 acres to supply the mill, which has a capacity of 150 million board feet annually, the whole area is expected to be cut over in 40 years. After being cut over, the suitable portions are sold for grazing ground or agriculture, the lower slopes will fetch perhaps 5 dollars for grazing, and the bottom lands anything from 10 to 100 dollars per acre according to the accessibility to the towns.

One of the chief reasons why the cut-over lands are sold is the incidence of taxes, which are on the land and not on the

lumber. The imposition of the taxes lies with the authorities in the counties, the county being the sub-division of the State. An unfairly high proportion of the taxes are derived from forest lands, but they form a reliable source of revenue. There are several ways of combating this, which is one of the chief causes why privately held timber lands are given up after being cut over, and which is therefore of the highest importance to the preservation of a sufficient area of forests in the county. This may also be said to be one of the principal reasons for the prevalence of forest fires. When the timber has been cut out in any particular area it is to the advantage of the land-holders that fire should run through and clear off the remaining lumber so that the land may be sold off at the best rates to settlers. The question is a difficult one to settle owing to the large number of counties whose interests are involved, but its settlement would form an important stepping-stone towards the accomplishment of a sound forest policy for the country.

*Reservations and Education of the Public.*—It is owing to the destruction of the forests, to the waste, the use without foresight of nature's bounties, which seems to be inevitable in human nature when brought face to face with great natural resources, and which has taken place in this case on account of the rush for cash, wealth and the disadvantages of holding on to forest estates—on these accounts the Federal Government, at the instigation of a few, has in the last 12 years stepped in and withdrawn from sale and settlement certain large tracts, all in the mountains of the thinly populated Western States, and constituted them forest reserve. What the intrinsic forest value of these reserves is, the writer cannot say. Much of their area lies at the highest elevations on main watersheds, and they thus form part of the agricultural backbone of the country.

The process of forming the reserves perhaps found its prototype in Indian forest administration. But whereas in India the Government is a law to itself, in a free country before action is taken the case for and against must be made clear to the public. There may then be said to have been three parties in the States, namely, the members of the powerful lumber industry, the few persons interested in the economical use of the forests, and the public. It is probably right to say that the case for forest conservancy made little way until it was properly stated to the public. This was the logical way, and it was done and is being done still largely through the agency of the newspapers. Needless to say, great facilities are also offered to, and accepted especially in the East by lumbermen to induce conservative working, but no Anglo-Indian Forest officer can fail to notice the newspaper-enterprise of the Forestry Bureau, the numerous articles of general or local interest on forest affairs in local papers, or the effect of this crusade on the opinions of the general public as represented by the comments in the newspapers and of casual fellow-travellers by rail or in hotels. Thus the mature general public is

kept informed and educated. What is being done for the young the writer cannot say. It seems, however, certain that if more efforts were made to educate the children of all countries in the economical use of the land and its varied interests, in addition to the social life of rural districts being made more attractive, the dangers and inconveniences would be diminished which are caused by the inrush to the towns and the scarcity of labour on the land, and this applies to forestry also.

The Federal Government having determined on forest reservations, did wisely in making a big thing of it. If they went ahead of public opinion there, they also appealed to the public vanity. Since then, there is no doubt, they have carried the people along with them, so much so that the question of spending a large sum of public money in acquiring a large forest estate in the east in the Appalachian Mountains is favourably commented on, and although there are naturally interests which are opposed to the withdrawing of timber lands from sale and their reservation, lumbermen have by their past treatment of the forests to a great extent spoiled their chances of securing a verdict, while those who already hold such lands are not more sympathetic, as the withdrawal of large areas, and the fact that little or no work is being done by Government, except where essential, as in the Black Hills, South Dakota, has limited the supply and forced up prices. The administration of the reserves is not yet in the hands of the Bureau of Forestry. In a country where money is turned over so rapidly as in the States, the creation of forest reserves by the central Government is in any case doubly essential. Few private proprietors can afford to hang on for a second crop at present. This is the case only until the country has filled up and the scale of living becomes normal. At present the cream is being taken off the land, and it may undoubtedly be said that, at least in the case of agriculture, this fact coupled with the characteristic energy of the Americans enables them to compete unduly with producers in the older and less productive countries of Europe.

The present sparseness of the population and the condition to which the forests have been reduced, are factors to the success of the present policy of making large reserves. There is so much land of the required class to spare, lapse of time will, it is to be expected, witness the simultaneous filling up of the country and the growth of the forests into valuable State property. A big start has been made at a fortunate time towards providing for successive generations a sufficient timber supply, at least for the home demand. We are told that the consumption of wood per head per annum in the States is 350 c.ft., of which one quarter is timber, while in England the corresponding figure is only 13 c.ft. With rising prices and a failing supply, for the present at least, the consumption in the Western States, in which, as in Japan, nearly all the houses are built of wood, would seem likely to diminish somewhat rapidly, and given proper measures

of conservative working, Government and private enterprise should be able to cope with the demand for the home market and leave a good deal over for export.

*Forests of the Eastern States.*—After leaving the Yellowstone Park, we made an interesting side-trip to the Black Hills in South Dakota, a compact reserve of 2,000 square miles of *Pinus ponderosa*, situated mainly on archæan and granite formations, its chief purpose being to supply the gold mines with pit props, etc. The reproduction of this pine is very easy. Apart from this reserve, however, the plains of the Middle West, from the Rocky Mountains for two-thirds of the way to the Mississippi at St. Louis, are devoid of tree growth. East of that, as we neared the great rivers, we passed into country which is often much like that of the Indian (B. I.) plains, very flat agricultural land with groves of hard-woods, which have, without exception, been cut over. This is the commencement of the *Summer-green Deciduous Forest of the Atlantic Forest District*.\* From St. Louis, through the southern parts of the States of Illinois and Indiana and through Kentucky and Tennessee to Asheville in the Appalachian Mountains in North Carolina, we passed through more or less undulating country of wheat and cornlands with numerous small mixed woods of oaks, maples, chestnuts, tulip trees and other species, including pines (*Pechinata*), a striking contrast to the great coniferous woods of the West. This class of hard-wood forest has its best development in the mountains. The writer had the good fortune to visit the Pisgah forest (210 square miles) belonging to Mr. Vanderbilt, in the Appalachian Mountains. Though intersected to some extent with cultivation, often small holdings, in the valleys, the forests on this long chain of mountains present a wonderfully unbroken aspect. From the Mississippi River onwards we are in the original states, and there are no forest reserves as yet. The woods, the remnants of the old forests, have all been cut over long ago, but are still valuable, and the population is still comparatively sparse, while much of the more undulating ground is eminently forest land. The slopes of the Pisgah Mountain forest have also been nearly cut over in the past, but the stock, though now somewhat open and crooked, has the elements, to say the least, of a very valuable forest property. The principal species are Sweet Chestnut (*Castanea vesca*), oaks (*Q. alba*, *Q. rubra*, *Q. coccinea*, *Q. tinctoria*), tulip (*Liriodendron tulipifera*) and many other broad-leaved species with hemlock (*Tsuga canadensis*), and at higher elevations Silver Fir and Spruce. Under the conservative but progressive treatment now in vogue on this private property the cores only are being worked, but the coupes are heavily felled over, seed trees of Chestnut, Oaks, Tulip trees, and Locust (*Robinia pseudocacia*) and black Walnut being left. Chestnut wood fibre is now being used for the extraction of tannin. Tulip timber (yellow poplar) is remarkably

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\* C. S. Sargent.

straight and free from knots, and has the qualities of spruce. On the hill tops are many old pastures. The grazing rates are three dollars for six months. The beauty of the forest is greatly enhanced by the heavy growth in damp localities, where the canopy is open, of the white rhododendron (*R. maximum*) and *Kalmia*. We are here at the southern extremity of the white pine (*P. strobus*) area, and North and West of, and too much in the mountains for, the three well-known pines of the Southern States. A little way east of the Appalachians, we pass into these *Coniferous Forests of the Atlantic Forest District*.

In these Eastern States there are the mountains of the New York and New England States and the Appalachian or Alleghany Range, which are natural big forest lands. There are also the southern coniferous areas, of which the writer can say nothing. The numerous deciduous woods in the greater part of the remainder are all private property, and are of much the same quality as many in England. The timber of the better class and more valuable species has been mostly culled and the woods are immature and openly stock-d, but the young growth and small poles (consisting in North Carolina of pine, tulip, maples, oaks) are promising.

Can such woods be made profitable to private owners and the country at large?

Lumbermen in the east show more inclination to adopt conservative working than those in the west. It is already known to readers of this periodical that the Forestry Bureau has made special efforts to induce private owners to work conservatively and to have working plans made for their forests by the Bureau. Applications are sent for working plans, and these are at present made for "the lands most likely to furnish useful examples. A working plan once prepared will not be put in effect unless it is satisfactory to the Division of Forestry and to the owner" (Circular No. 21 of 1898). The applications received have been very numerous and involve a large area, and are quite beyond the capacity of the present staff of the Forest Division. In almost all cases the owner wishes to get larger interest on his capital than can be furnished by forest growth. The average area of the lumberman's annual coupes is too large for the work to carry on until a second crop can be obtained. We have it on the best authority that owners are likely, under systematic working, to prefer to get a larger periodic rather than a smaller annual yield, and that they will keep on the land for the second crop. The question of taxes hinges on this again. In dealing with lumbermen on their own lands Government can only take them by the hand and lead them on slowly. The matter is largely a "business proposition," the rotations will be financial, working plans must be of the simplest kind. To us it seems that Government would do well also to take up areas of sufficient size of the half dozen or so principal species and give a more detailed and scientific (and not less business-like) exposition of the best forest methods with annual coupes. European



methods may seem too conservative to Americans, but even if this view is correct, the happy mean undoubtedly lies far nearer the European than the present American standpoint. Science and conservatism are in this case synonymous, but looking at the interests involved, we cannot expect progress in their direction to be other than slow. To summarise: No doubt the discussion about the correct methods and intensity of treatment is of much importance and will become acute among scientific foresters, otherwise they would hardly be entitled to the name, but to an outsider it appears that the premier work still lies in the maintenance of public interest in the general forest question and in the provision and preservation of a sufficient area of reserves, suitably located, and their protection from damage, especially fire, and the same in the case of private forest property.

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### A Day with Hounds.

A violent hammering on the door which, so inexplicably during sleep does one's brain work without any expressed authority or conscious exertion of will-power on our part, coincided curiously with the deafening thunder of a terrific storm with which I was battling in my dreams far up in the mighty Himalayas in a manner altogether too realistic to afford one much rest. The thunder crashes became louder and more continuous, finally becoming so violent as to snap the thin thread linking sleep to wakefulness and bring me out of the land of nod. It was but to find that the tempestuous warfare of the elements of my dreams was being repeated with a vengeance in the real world without. From the discordant syren-like whistle of the wind as it tore round the angle of the wing I was occupying, from the crashing of the tall tapering-topped pine trees in a closely adjacent clump, and the sharp pattering of the rain drops driving against the casement, it soon became obvious to my sleep-dulled senses that this was no land of dreams. A three-quarter gale was blowing outside and a devil of a din going on as the result of it. The first feeling of relief that I was snug under the counterpane in an English country mansion, and not up in the wild picturesque but decidedly uncomfortable (in a storm) Himalayas, was rapidly followed by one akin to despair. The remembrance came on me in a flash—was there not to be a meet some eight miles away, and was it not my first for nearly seven long weary years? Surely that fickle flirt the Goddess Fortuna was not, could not be, after carefully bringing one through great stress, and fortune good and ill, all these years to the very morn of the long looked for day—surely she was not going to chuck one over at the last moment. Her sex delight in doing so, one knows, and there was every indication that this was her intention in the present instance. It was still as black as pitch outside, but as one's toilet proceeded a fitful daylight struggled, and struggled almost in vain, with the

fembrean darkness. Of sun or sunrise there was not a vestige. Only the rain-soaked pine trees stood out by degrees less faintly, could be seen a little more distinctly against the stormy, cloud-laden sky. The wind still kept to its wild dirge, the accompaniment of the crashing branches being not untuneful, though rather too mournful for a hunting morning. Was it, is it, good enough one could not help wondering! One's mind conjured up so vividly, too vividly, the prospect before one. The jog, jog along the 8 wet miles of sodden muddy country road in the tempestuous wind and driving rain; the, in all probability, dreary wait for the late hounds, and later Master, the latter of whom would be sure to wait a bit to see if it was going to lift before he set out, the perhaps aimless wandering from covert to covert as blank after blank was drawn, the rain meantime soaking one through, running down inside one's collar and trickling down along one's marrow bone, whilst every tooth chattered as if it wished to play a tune to its own notion of time and without reference to the messages sent to it from the brain along its slender, but at times diabolically sensitive, nerve chord. One's mount meanwhile, as miserable and dejected as oneself, splaying about in the mud like a camel carrying one's best crockery after a Christmas rain shower in Northern India. Such was in all probability the least of the disagreeables to be expected on such a day, and things might prove so much worse. Visions of undesirable resting places in muddy ditches, unlooked for baths in ice cold water, flitted across one's mind as one mechanically finished dressing and went down to the breakfast room. A cheerful fire, which only made the inferno going on outside the drearier; no one else down, and a query elicited the information that they were all in bed. No one else evidently was going to be such a lunatic as to face the elements on such a morning. Gulping down breakfast one swore at fate, at the fickle jade who had brought one to such an impasse. For had not the sunset and sky of the evening before, so anxiously scanned, been full of signs and portents full of promises of a fine hunting morning—at one's boots, which were too tight, cravat which was choking one, and at oneself for being such a fool.

Once out and battling in earnest with the wind and rain one began to forget the discomfort. To be again on the way to a meet! Those who have been out know what it means. Already the blood flows and quickens in its rush through the veins. The eight miles are passed o'er like a dream, and one reaches the Crow and Gate Inn, the rendezvous,—such a picturesque spot one knows it to be in the sweet spring and summer months, but one has to take all that on trust just now. Through the driving rain and mist, the quaint gabled hostelry looms suddenly upon one, the old signboard giving out a weird uncanny sound as it tosses wildly to and fro under the buffeting of the wind. A quaint signpost that with its pictorial representation of a weird, wild-looking feathered creature, purporting to be a crow, perched on a gate, the

dimensions and timbers of which would make the boldest hold his breath whilst he tried to negotiate it, and would not unlikely cause him to hold it for good.

A few shivering forlorn hunters were being led about by heavily cloaked grooms, three men and a girl were leaning against a sheltered wall of the house, and that was all! No hounds! No Master, at present! We joined the men and the girl. No one said anything. What was the good? Things spoke for themselves too plainly.

A quarter of an hour, and then another, passed. A few more people had turned up, several others were sitting cowering beneath waterproofs in traps and other vehicles. A crack of a whip, and at last hounds turn the distant corner of the road, followed by whips and the Master. A move is made by all, and shivering women and men climb into the saddle, the hunters by far too dejected to show off or play pranks, the starch being taken out of even the most vicious kickers, which, existing in every hunt, require marking down and careful watching, for their room is ever to be desired to their company. We move off, a crest-fallen throng of under thirty. One is cogitating as to whether to make up one's mind to stick as close as possible to hounds or to follow one or two of the knowing ones. After such a long absence it is difficult to know what best to do. One has almost made up one's mind to stick to hounds when one of the best, whose place is ever in the fore front, wheels to the left and goes off into the mist. A moment's hesitation, and one follows. Crossing a couple of fields the man in front takes up a position at the corner of the wood to be drawn. If his hopes are fulfilled we shall get a clear lead. We sit sheltered from the wind a little, but with the rain soaking and resoaking through us, and dripping from our boots as from a spout. We hear the hounds at work now and then, but it is difficult to either see or hear under present conditions. Nothing appears, and one begins to get uneasy. My companion, who has been sitting like a Centaur, suddenly gives vent to a deep and earnest malediction and, topping a fence, disappears. One follows, only to realize that hounds have gone away, and one has been too clever! We hurry to the other side and set off in pursuit. My companion raises my hopes, and turning away to the left, informs me that on such a day the fox will probably run left-handed. But ten minutes later his prognostications are verified, and we have that sweetest of all music, the music of hounds in full cry, going across our right front. By keeping straight and hard we get up, and whilst mentally poring out oblations to the fickle one, now fickle no longer, I make up my mind, for the hundredth time in my life, to stick to hounds in future as long as they and my mount will permit of it. We are up, and from forms appearing as shadows now and then out of the mist it seems that most of the field are well in. But it is not for long. We all but run into hounds scattered about

in the vapour clouds. They are at fault! Whilst waiting, the mist and driving rain lighten and a feeble wan ray of sunshine, or what stands for such in England at the present day, makes itself felt rather than seen. It is the commencement of a lull in the storm, and as we move off to the next covert, for hounds have in the end to be lifted, the meteorological conditions assume a fairer aspect, though the clouds still hang lowering on the surrounding hill crests. Two coverts are drawn blank, and as one munches rain-sodden sandwiches one's feelings again sink to zero point. The field has already decreased to half, and but ten of us move off to the Park Woods. The Master tells us he will try there and then take hounds home. The ten of us look at one another and wish we were there already. Even the keenness engendered by an absence of six years is oozing away at such an unlooked for first day, admitted on all sides to be the very worst yet experienced this season, already a record bad one as far as the weather is concerned. We huddle together and wait. Hark, the music is commencing, and before one right well knows what is happening we're off over the sodden plough, hounds making the pace a cracker after an old dog fox. Down a steep hill side we pelt, scramble through a wide brook at the bottom, usually a shallow placid stream, but now taking the horses to the girths, and up a bad hill on the other side. The going is cruel, the almost continuous rain for months on end having reduced the ploughs and grass lands to clayey marshes or marshy bogs, rendering the take-off at every bank and fence as unknown a quantity as the algebraical 'x' of our younger days. Rushing along the crest of the hill hounds swing to the right and, dropping into a long valley, pour into and out of a small covert, being at fault on the far side. What a mercy one mutters as one hears one's steed's labouring breath and feels his shortening stride and flagging energy. What a blessing! A check! It is not for long though. In their eagerness hounds have run out of scent. The Master knows his work, knows his hounds, is well up in his country, and is well versed in the wiles of his slim quarry. Quickly does he get the pack on the line again, and they go streaming away back into the long valley at a hot pace. The horses, bless them, are not one whit less keen than their riders, and the halt, short as it was, has patched up for the moment weakened bellows. Down we go, our mounts sliding down bad parts on their haunches, after the manner of elephants going down a steep bank, to the stream again, here much shallower and wider; through it at a hand gallop, the crossing reminding one of many a stream, swollen and turbid, negotiated on marches in the rainy months in far-away India, and on to the plough on the other side. Friend fox had swung right-handed here, and continued straight up the valley—all heavy plough with a sprinkling of fences, nothing at ordinary times, but real obstacles with the country in its present state. Near the head of the valley

hounds turned to the left again, going diagonally up hill straight for a small covert situated on the other side, but whose near edge just topped the crest. The pace was slackening, the horses nearly done, as we reached the crest—a baker's half dozen of us. One prayed for a check, if but for a few minutes, but on topping the summit all hope of such vanished at once. Master Reynard was evidently too hard pressed on reaching the covert side to have time to look for a friendly shelter within it. The risk was too great, as he knew the chances were all earths would be stopped. From our position one was able to take in at a glance exactly how matters stood. Two-thirds down the slope a blackish spot was creeping along; two fields behind were the foremost hounds straining along in screaming chorus; a field behind them the Master on his great powerful chestnut. Ye gods! what a glorious sight it was! Not a second did one lose. It was now or never to be in at the finish and—well we omitted to remember that man was built with a neck connecting the cranium that carries the brain with his trunk. Whilst we were still three fields away hounds run into their fox, and not a moment too soon. As one sprang from the saddle and loosened the girths friend Pluvius changed from fine drizzly to his former steady downpour. But how different were the conditions now to previously! Then, cold, shivering, sceptical, with the blood running sluggishly through the veins at its normal pace. Now, a rollicking run to our credit, one's pulse beating 20 above normal, which would mean an ice pack at once if one's Indian sawbones got hold of one, and one's blood boiling through one's veins like molten lava running down a hill side. Rain! Yes, it rained in torrents; the clouds came down and quickly shut out the remaining available light of the short winter's day, and as we jogged the fifteen miles back the gale got up again and blew in fury. Cold, wet, tired, covered with mud from crown to heel, we arrived home smiling.

Over the smoking room fire after dinner we answered our morning query—Was it, is it, good enough? It was!

THE VAGRANT.

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## VI.—EXTRACTS, NOTES AND QUERIES.

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### British Forestry.

The *Times* of March 16th gives the following account of the recent debate on British Forestry in the House of Lords:—

Lord Barnard rose to call attention to the report of the Departmental Committee on British Forestry, and to ask the President of the Board of Agriculture and Fisheries whether his Majesty's Government proposed to take any, and, if so, what, steps to give effect to the recommendations of the Committee on the subject of education, instruction, and training in forestry.

He urged that the growth of timber in this country was very far short of what it might be, and that the report of the Committee deserved the serious attention of the Government.

The Earl of Onslow said that the subject was a very important one for the country, as experts assured us that foreign supplies of timber were diminishing in quantity, and that in the future the value of timber was more likely to rise than to fall. At the same time there were large areas in the United Kingdom which could be profitably planted with timber. It was not the practice of the Board of Agriculture to ignore the recommendations of the Committees which it appointed, and the Board proposed to act on the recommendations of the Departmental Committee in which the noble lord was interested. On Mr. Stafford Howard's initiative the first steps in that direction had already been taken. Without any assistance from the Treasury a school of forestry had already been established by the Commissioners of Woods and Forests in the Forest of Dean. This school would primarily be for the education of woodmen, and the course of instruction would fit the students to become foremen on large estates. Again, through the agency and assistance of the Office of Woods and Forests, the Scottish Office had entered into communication with certain Scottish landowners to secure suitable areas for planting. The Treasury had been approached by the Board of Agriculture, and had promised assistance in the foundation of at least two forestry schools in England. Where these schools would be established he could not yet say; but applications had been received from many colleges, and from the University of Cambridge. He had been considering whether the University of Cambridge should not have the first claim to the attachment of a school of forestry; but no decision could be arrived at until the Secretary of State for India had decided what was to be the future of Coopers Hill College. Suggestions had been made that the School of Forestry for India at that college should be removed, and a committee was now sitting on the subject. His desire was to establish the two schools in different localities—one for the training of young men who were likely to become landowners or land agents, and the other for woodmen. The former he should prefer to see attached to one of the great Universities. There was a strong feeling in the country that we should not be behind foreign nations in our knowledge of wood-craft, and that our resources ought to be made more use of.

This method of utilizing the soil the Department was most anxious to encourage, and by the training of young men of both classes in the science of forestry they believed that by making a small beginning now they might be enabled to lead up in the course of years to great results. The time might come, therefore, when this country would be able far more than at present or in the past to rely upon its own resources for the production of forest timber.

Lord Avebury said he was glad that his noble friend had raised this question. He had made it his business to visit several countries in Europe in connexion with afforestation, and it was certainly a matter of surprise to find that there was no school of forestry in this country. He congratulated the Government on the steps they were now taking, believing that the development of forestry would be of great value to agriculture in this country.

The Marquis of Granby said he was grateful for the encouragement which was being given by the Department to forestry. The question, however, resolved itself into one largely of money. A large portion of the land in this country which could be afforested was in the hands of private owners, and under the existing law there was not so much encouragement as might be given to proprietors to plant largely. In Russia, for example, newly planted plantations were exempt from local and Imperial charges for 30 years after planting.

Lord Reay drew attention to the scientific methods of forestry pursued in India, and urged that students at Coopers Hill, instead of going abroad to obtain practical experience, should be able to find all the elements of training at home necessary for practical teaching.

The Earl of Powis said that, according to a statement which had been made by the President of the Board of Agriculture, Bangor would be selected as one of the schools of forestry. He was strongly of opinion that Wales was one of the best situated districts in the country for the study of forestry. He should not regard the district of Cambridge as an eminently suitable one for timber culture. North Wales, Durham, and Scotland, on the other hand, were districts where large well-managed plantations were to be seen. To the working classes the subject of afforestation was one of great importance, because a large population could be employed when the forests came to be cut down. He suggested, further, that it might be well worth the consideration of the Treasury if money could be advanced to landowners on easy terms for the purposes of afforestation, the reason being that of course landowners could not lock up a very large amount of capital for a long time.

The Earl of Onslow, in reply, stated that one of the main objects the Department had in view was the training of experts. He thanked the noble lords for their promise to give students of the forestry schools opportunity of gaining practical experience in woods which they owned. The Universities of Wales and Bangor were prominent among those which would be considered by the Board of Agriculture.

## VII.—TIMBER AND PRODUCE TRADE.

**Churchill and Sim's Wood Circular.***6th April, 1904.*

**EAST INDIA TEAK.**—The deliveries in March have been 997 loads against 948 loads in March, 1903, making the total for the quarter 2,784 loads as compared with 2,514 loads for the first three months of last year. There is no change to report in this market; the stock is just under that of last month and prices just about the same. The prospects for a continuance of restricted business ahead remain unchanged.

**ROSEWOOD.**—East India.—Good wood, of fair sizes, sells well, but inferior logs can only be cleared at low rates.

**SATINWOOD.**—East India.—Sales have been small as the demand is quiet, and high prices expected by shippers restrict business.

**EBONY.**—East India.—There is very little enquiry, and sales are difficult to effect.

**PRICE CURRENT.**

Indian teak, logs, . per load ...	... £10 to £18
" " planks, " ...	... £12-10s. to £20
Rosewood, East India, per ton...	... £6 to £12
Satinwood " per s. ft....	... 7d. to 18d.
Ebony " per ton ...	... £5 to £10

**Denny, Mott and Dickson, Limited.****WOOD MARKET REPORT.***5th April, 1904.*

**TEAK.**—The landings in the docks in London during March consisted of 161 loads of logs and 355 loads of planks and scantlings, or a total of 516 loads, as against 902 loads for the corresponding month of last year. The deliveries into consumption were 443 loads of logs and 454 loads of planks and scantlings—together 897 loads, as against 947 loads for March 1903.

The Dock stocks at date analyse as follows:—

6,366 loads of logs, as against 5,281 loads at the same date last year	
4,008 " planks " 2,780 " " "	
— " blocks " — " " "	
<b>Total</b> 10,374 loads	8,061 loads



In addition to the above statement, the following figures for the quarter in comparison with the first three months of 1903 should be useful:—

				1. 04.	19. 3.
				Loads.	Loads.
LANDINGS.—	{ Logs	...	...	765	1,201
	{ Planks	...	...	1,225	1,220
	Total	...	...	1,990	2,421
DELIVERIES.—	{ Logs	...	...	1,346	1,314
	{ Planks	...	...	1,129	1,070
	Total	...	...	2,475	2,384

The experience of the first quarter has served to deepen, rather than to lighten, the want of confidence with which the new year opened. Abnormal prices have been paid for some descriptions of Quebec goods, whilst teak and mahogany have held their own as the inevitable consequence of the supplies being as light as the consumption; but not from any increase in the demand, which continues to fall away in all classes of goods. Nearly all descriptions, other than the above exceptions, have weakened in price, and purchases for consumption have been confined to actual necessities, partly through the natural fear that the general restriction of financial facilities may lead to "pawned" goods being thrown on the market for forced sale, and partly owing to a general recognition that speculative finance must be discouraged by ordinary traders, as well as by the Bankers and Brokers who, in ordinary times, are perhaps too ready to encourage weak traders to recklessly compete against the sound ones, and so make business difficult all round. The usual crop of failures is evidencing itself, now that the tests of depressed business and restricted financial facilities have come about.

### Market Rates for Produce.

*Tropical Agriculturist, April, 1904.*

Cardamoms	...	...	per lb.	1s. 5d. to 2s. 7d.
Croton seeds	...	...	" cwt.	15s. to 20s.
Cutch	...	...	" "	22s. 6d. to 30s.
Gum Arabic	...	...	" "	15s. to 20s.
" Kino	...	...	" lb.	4d. to 6d.
India-rubber, Assam	...	...	" "	2s. 3d. to 3s. 7d.
" Burma...	...	...	" "	2s. to 3s. 3d.
Myrabolans, Madras	...	...	" cwt.	5s. to 6s. nom.
" Bombay	...	...	" "	4s. to 7s.
" Jubhulpore	...	...	" "	4s. to 6s. 3d.
" Bengal	...	...	" "	3s. 6d. to 5s. nom.
Oil, Lemon grass	...	...	" lb.	8d. to 8½d.
Orchella weed, Ceylon	...	...	" cwt.	10s. to 12s. 6d.
Seedlac	...	...	" "	170s. to 190s.
Tamarinds, Calcutta	...	...	" "	8s. to 10s.
Madras	...	...	" "	4s. 6d. to 6s.





**Colonel G. F. PEARSON.**

# THE INDIAN FORESTER.

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## **Pioneers of Indian Forestry.**

COLONEL G. F. PEARSON.

Colonel George Falconer Pearson, eldest son of the Rev. George Pearson, Rector of Castle Camps Camly, was born at Chester in November 1826, and educated at the old Charterhouse in London under Dr. Saunders. In January 1846 he went out to India as a cadet on the Madras establishment, his commission having been given him by the late Sir James Weir Hogg, the Deputy Chairman of the Honourable East India Company.

Arriving in India at the end of May 1846, he found himself posted to the 33rd Regiment, Madras N. I., then stationed at Janbuat in the Hyderabad territory, and joined it there shortly after. Here he soon learned his regimental work, and having passed the Higher Standard in Hindustani at the end of 1848 he was appointed A. D. C. to Sir Herbert Maddoch, then Deputy Governor of Bengal at Calcutta, but on that gentleman going Home in the year following, he reverted to regimental duty, and was almost immediately after appointed to the Adjutancy of his regiment.

This post he held for more than five years, interrupted only by a six months' shooting trip to the Himalayas, one month of which was spent in Tibet. In 1854 when at Nagode in Bundelkhund with his regiment he made the acquaintance of Colonel S. A. E. Ludlow, R. E., the Chief Engineer of those Provinces, and at his recommendation he was transferred to the Public Works Department as an Executive Engineer, and in that capacity he constructed the road from Nagode by Kalinjhur to Banda, for which work he received the thanks of the Supreme Government. This road afterwards in the Mutiny proved of great service, as it was the only one west of the Mirzapore and Jubbulpore Road by which artillery and wheeled carriages could cross with facility the high range of ghats which separate the high plateau of Bundelkhund from the valleys of the Ganges and the Jumna. Early in 1856 he was sent to Jubbulpore to lay out the road from that station to Mundla, and on the completion of that work he proceeded Home on long leave.

In the following year of 1857 the Mutiny broke out, and Colonel Pearson was at once ordered back, and rejoined his

regiment at Jubbulpore, where it had been moved on the Mutiny of the 53rd Regiment Bengal N. I., and where it formed the nucleus of what was known as the Saugor and Nerbudda Field Force, which afterwards formed a Brigade of Whitlock's Division. With it he took part in most of the operations that were undertaken in that part of the country, also in the action at Patun, and in the "drives" that were made through the Damoh jungles to turn the rebels away from the line of the Nerbudda River, and to force them northwards. But in February 1858 the 3rd Regiment of Nagpur Infantry mutinied at Raipur and murdered their Sergeant-Major, when the 33rd Regiment, M. N. I., were detached from Whitlock's Division with a battery of artillery and were marched direct through Mundla by the Rajahdhar Ghat to Raipur. In this march Colonel Pearson's local knowledge came in very useful. The mutineers, however, had decamped before the arrival of the force at Raipur, and after remaining there about a month the regiment returned to Kamptee for garrison duty.

Just at this time a number of irregular corps, called Military Police, were being raised in Central India to clear the country of the rebels. Each corps consisted of a squadron of cavalry and four companies of infantry, about 600 men in all, with a Commandant and Adjutant, and a Quartermaster. Colonel Pearson was appointed to the command of one these corps, the headquarters of which were at Seoni. Taking with him a nucleus of drill instructors and men from his own regiment, and from the 2nd Hyderabad Cavalry, which formed part of the force to which his regiment had been attached on service, in about three months he had ready a thoroughly efficient body of men for the work they had to do. It was now that his first acquaintance with forest work began. Mr. Arthur Cocks, of the B. C. Service, who had greatly distinguished himself in the Mutiny in Upper India, was then Commissioner of the Saugor and Nerbudda Territories, and under his orders it was Colonel Pearson's duty to patrol the great forest tract which covers the upper part of the Nerbudda Valley and the upland plateau which now constitutes the Mundla, Seoni and Balaghat districts as well as part of Bhandara.

Now, as soon as the Mutiny was suppressed, this forest tract literally swarmed with timber dealers and contractors, both European and Native, in quest of timber for sleepers and railway works which the Government had vigorously taken in hand. Armed with parwanas, or orders from the civil authorities, it was easy for them in a country where every Gond carried an axe to strew the jungle with fallen trees, while no attempt was made to collect or store them; in fact in most cases it was impossible to do so, with the result that when the forest fires set in, the greater part of the fallen logs were either entirely or partially burnt and destroyed. This was continually brought to notice in his reports,

and this no doubt paved the way to the formation of a department whose duty it would be to preserve the forests from ruin. In August 1860 Colonel Pearson was appointed the first Conservator of Forests in the Saugor and Nerbudda Territory. Two years later the Central Provinces were formed into a Chief Commissionership by the addition of the Province of Nagpore, which was added to his charge; and in 1865 the forests of the Assigned Districts of the Berars were also placed under him, so that from 1860 to 1868, when he was transferred to the North-West, his time was entirely employed (with the exception of two short absences at Home) in organising and establishing a regular system of forest conservancy in these Provinces. This work consisted in—

1. Exploration and rough surveys of the forests.
2. Demarcation of reserves and of the forests assigned to villages.
3. Fire protection.
4. Collection and sale of timber, and the gradual development of revenue from minor forest produce.
5. Forest legislation.

It is not the place here to discuss the details of this work, which are well described in Mr. Ribbentrop's excellent work on Indian Forestry. But it would not be right to omit the names of those, some in high administrative positions and others as workers in the forest, without whose assistance the work of forest conservancy could not have been carried on. After Sir Dietrich Brandis, the Inspector-General, whose sound practical advice and guidance was always available to his subordinates, and kept the work going on sound lines, must be cited first the name of the late Sir Richard Temple. There was no more staunch and whole-hearted supporter of sound forest conservancy than he was, not only in the Central Provinces but also in Bombay and in other parts of India, and with his name must be coupled that of Sir Charles Elliott, afterwards Lieutenant-Governor of Bengal, but then Settlement Officer in Raipur and Hoshangabad. It was due to his broad views and sound judgment that the thorny questions which attended the demarcation both of the reserves and the village allotments of forest were settled on a broad and liberal basis in those important forest districts in such a manner that the wants of the people in wood and grazing were amply provided for, while the rights of the Government were amply safeguarded; and what was done in these districts was a useful and practical guide to similar arrangements that had to be made elsewhere. Of those who worked in the forests as Colonel Pearson's assistants Captain Forsyth stands as one of the first, not only on account of his most valuable exploration work, but also that after he left the Forest Department to become Deputy Commissioner and Settlement Officer in Nimar, he so to speak invented and worked out the system of revenue from minor forest produce which has since done so much to help the financial side

of the Department. Doveton and Douglas were both sound pioneers in the work of fire protection, in which they did invaluable service, and Brereton by his service in mapping the valuable teak forests in Aheree deserves to be remembered in the same category.

During this period Colonel Pearson did a considerable amount of miscellaneous work for Sir Richard Temple, in addition to his regular forest work, among which may be cited the repair of the bunds of the irrigation tanks in South Bhandara and the collection of local information that Sir Richard Temple then required for the alignment of a direct railway from Nagpore to Calcutta through Raipur. Sir Richard Temple submitted to Government an exhaustive report on this railway, and though it was shelved for some years, this project has long since been carried to completion. It is to be presumed that this report was found useful to the engineers who built the line, as the general alignment was almost exactly followed even to the crossing of the principal rivers and hill ranges.

In 1868 Colonel Pearson was transferred to the North-West Provinces as Conservator. In these Provinces preliminary steps had already been taken to assert control over the forests by giving the local civil officers charge over them; more especially in Kumaon and Gurhwal, and also in the Terai, where the forests had been placed under Sir Henry Ramsay, the Commissioner, and who had taken definite and effective steps for their management. The Dhoon and upper Ganges Valley had been placed under the Commissioner of Meerut, but here, from want of supervision, a good deal of money had been wasted without much practical result. In Jhansi and Gorakhpore very little had been done. There was then a great deal of work spread over a large tract of country to be got through, and the next two years were very heavy years of work, both of an administrative nature, and necessitating much heavy physical exertion with long marches and forest explorations both in the hills and in the plains.

First regular forest conservancy was started in the Dhoon under Doctor (now Sir George) King, who proved a most able forest officer full of indefatigable zeal. On his removal to the Botanical Garden at Calcutta, where his great work in India has been done, Mr. Brereton was brought up from the Central Provinces to succeed him. In the Ganges Valley the road which had been commenced by Mr. Williams was completed up to the Gungootree Forest by Mr. O'Callaghan, with a series of excellent wire rope bridges all the way, including one over the Neeling Ganga, 400 feet above the bed of that river.

Sleeper works on a very large scale were also commenced in these forests, turning out some 400,000 sleepers annually, while arrangements were made for catching the sleepers in the river below Hurdwar. Then the forests of the Upper Tonse and Pabar were thoroughly explored and sleeper works established

there also on an equally large scale as in the Ganges forests, Captains Lillingston and Greig being placed in charge, assisted by the first trained forest officers from Nancy, Messrs. Heinman, Moir and Pengelly. Under their supervision the first water slides and sledge roads were built in these forests, without which it is not too much to say these forests could never have been worked. Two thousand sawyers were constantly at work here, chiefly Sikhs from the Punjab, and the outturn of sleepers was about half a million a year. On one occasion Colonel Pearson crossed the high pass below Bunderponch direct from the Ganges into the Upper Tonse forests in the Herby Dhoon, which is nearly 19,000 feet elevation, saving a march round of twelve days. Besides this regular conservancy was started in Gorakhpore and Jhansi under responsible officers.

At the end of 1870 Sir Dietrich Brandis, the Inspector-General, returned to Europe, and Colonel Pearson was appointed to officiate for him during his absence. He continued to act in this capacity till he returned himself to Europe on furlough at the end of 1872. As the Government of India was at this time much occupied with pushing on the railways in the Punjab, as well as in completing the direct communication between Bombay and Upper India through Rajputana, much of his attention had to be directed to sleeper works, which continued to be pushed on with vigour in the Ganges and Tonse, and were extended to the upper Beas Valley in Kulu, and to Chumba. Arrangements were also made for extending the plantation work at Chunga Munga in the Punjab, and attention was paid to Bengal, where the forests had suffered much from bad and inefficient management, and Dr. Schlich was brought from Sind and appointed Conservator there. Moreover, a separate department for forest surveys and the supervision of working plans was started under Colonel Bailey, R.E., at Dehra, where since then the Forest School has been established. At the end of 1872 Colonel Pearson went Home, receiving the thanks of the Supreme Government for his services while officiating as Inspector-General.

Almost immediately after his return to England Colonel Pearson was deputed on the recommendation of Sir Dietrich Brandis to proceed to the continent and to visit the young men under training for the forest service in France and Germany, being officially attached, with the permission of the French Government, to the Forest School at Nancy, which was then under the direction of Monsieur Nauguet. Shortly afterwards he was definitely attached to the school for the supervision of the English pupils, who were all brought to Nancy so as to be under him more directly, and he remained there in this capacity till May 1884, or about eleven years, during which time sixty-three young men drawn from nearly all the public schools in the country passed through the Nancy School into the Forest Service in India. Most of these are now holding high positions in the Service.



Besides exercising general supervision of the pupils, Colonel Pearson attended all examinations and accompanied the pupils on their forest tours with the professors.

In 1876 Colonel Pearson retired from the Army on the pension of his rank, but was continued in his appointment at Nancy as before. In 1878 in addition to his duties at the Forest School, he was appointed as a Commissioner at the Paris Exhibition of that year, the whole of the raw produce of the British Colonies being placed in his charge, besides the large Indian Forest collection. For this duty he received the thanks of H. R. H. the Prince of Wales, who was at the head of the British Section.

In all Colonel Pearson was at Nancy from 1873 to 1884, or about eleven years; and it is right here to acknowledge the great kindness and support which he received from all the School authorities, especially from Monsieur Nauguette, the Director, and Monsieur Putors, who succeeded him in that post, as well as from Monsieur Broillard, who for many years had special charge of the English pupils in their preliminary course of instruction.

In 1884 Colonel Pearson was offered the post of Working Partner in the firm of Messrs. Davies Banks & Co. (the Kington and Radnorshire Bank) at Kington in Herefordshire, and in consequence gave up his post at Nancy to take it up, being succeeded there by Colonel Bailey, R. E. He then came to live at Dauntton in Radnorshire, about six miles from Kington, riding in practically every morning to his work, and leading the ordinary life of a country gentleman. But his connection with the Forest Service did not cease here, for on the reorganisation of the Board of Visitors at Coopers Hill, he was made a Visitor of the College on behalf of the Forests. This post he only vacated at the end of 1902, so that from first to last his official connection with the Forest Department extended over more than 42 years.

In 1896, after twelve years' residence at Dauntton, finding the rides to Kington in all weathers in the rough climate of the Welsh Hills somewhat more than he could manage without suffering from it, he purchased a small property close to Kington, where he now lives more conveniently for his work at the Bank.

Colonel Pearson has the Mutiny medal, also two decorations from the French Government. He is a J. P. for Radnorshire, and for several years served on the Standing Local Committee of that county. He was twice married, first in 1864 to Caroline, daughter of the Hon'ble A. Erskine, who died in the following year, leaving him with one daughter, and secondly to Emma, daughter of Mr. John Colvin, Lieutenant-Governor of the North-West Provinces, who died in the Fort of Agra in 1857 during the Mutiny. She died at Nancy in 1877, leaving him three sons, one of whom is a Lieutenant in the Navy, and another is in the Forest Service in India.

### **The Use and Abuse of Forest Work in Siam.**

The title I take the liberty to give this little article is borrowed from that in the February number of the *Indian Forester* entitled "The Use and Abuse of Forest Work in Burmah" as it struck me that a few notes on the forest administration in Siam might interest your readers, and might perhaps help to explain the rather stringent remark made by Mr. Gamble in his article on "Certain Important Forest Questions" in the November number of the *Indian Forester*, that in Burmah forest conservation and silviculture are subordinated to revenue-making.

The first fact to notice is that Siam as regards her forest conservancy is in the position that Burmah was 20 years ago. As Mr. Gamble's personal experience of Burmah dates even further back than that his remarks regarding Burmah would, I think, be more applicable to Siam now, as I presume his thoughts wandered to the Burmah of his time more than the Burmah of to-day. True, I am myself unacquainted with Burmah, but a three years' experience of Siam makes me feel that his remark is by no means inapplicable to Siam. The comparison may therefore prove interesting.

Let us take then Mr. Gamble's point that "forest conservation and silviculture are subordinated to revenue-making." "Burman" starts out to prove that there is no justification for this opinion as regards Burmah. Here in Siam I regret that there is ample justification for the statement, but on looking into the matter carefully I think a great many extenuating circumstances will be found.

I will now proceed to enumerate the chief points of forest administration in Siam, and at the same time draw attention to the extenuating circumstances.

Firstly then the graded list of Forests Officers consists of 24 officers, of whom 15 are European and 9 Siamese. Of the Europeans only five have had any forest training at all, while of the Siamese five have been trained, one at Coopers Hill and four at Dehra Dun. It may also be noted that with the exception of the three officers lent by the Indian Government, and therefore not permanent, the untrained officers occupy for the most part higher posts than the trained ones.

The above is practically the whole of the forest staff, as although a subordinate staff has been sanctioned very few posts are occupied owing, chiefly, to the difficulty in getting Siamese to undertake arduous outdoor work.

The 24 officers above mentioned have therefore to superintend the whole of the enormous forests which exist in Siam—an area of quite 100,000 square miles. On the face of it the task is of course an impossible one, with the result that so far attention has only been turned to the teak-producing areas which are confined to that part of Siam, north of the 16th parallel of N. latitude.

It is not to be supposed that this is the ultimate aim of the Government, for it is hoped that in the no very distant future a sufficient number of Forest Officers will be enrolled to enable the enormous tracts of forest in Lower Siam, and the Malay Peninsular Provinces in particular, to be taken in hand. At present there is no restriction on the felling of woods other than teak, with the result that at this moment more than one timber firm is carrying on a profitable trade in furniture woods from these Provinces without let or hindrance. Even with this restriction of the area to be supervised the divisions are of enormous dimensions, extending in some cases to the whole of a province.

It is obvious then that with no subordinate staff the supervision of such areas must be very superficial. The Forest officer must therefore make up his mind what matters are to be considered of importance, and what may be neglected, for to carry out all that would be necessary under a strict régime of conservancy is quite impossible. In most cases his mind is made up for him, and he is told to concentrate his attention on revenue-collecting, and, to put it shortly, the Forest officer in Siam is at present, and still will be for some time, much more of a revenue collector than a forester.

It must be remembered, and perhaps I should have mentioned this before, that the Department has only been in existence eight years, and, considering all things, has advanced wonderfully since its organization by Mr. Slade, now Conservator in Burmah, and whose services to the Siamese Government cannot be over-rated.

To explain what this revenue collecting means it is necessary to describe first the system on which the forests are worked.

At the time when the Department was first started the teak areas were being worked either by leases granted from Bangkok, or without leases, for there was no supervision of the work, and it only depended on the good will of the local officials to allow or disallow the working of teak in any district. A royalty was paid on each log, and no log was supposed to leave the forest until it had been stamped with the royalty hammer and had paid the royalty due. This rule was however seldom adhered to, and more often than not the royalty hammer was put up for auction by the official responsible for its use, the highest bidder then obtaining sole use of the hammer for a fixed period. This saved the official a lot of trouble, and was a lucrative business usually to the successful bidder.

Beyond this there were no restrictions; girdling was permitted everywhere, and there was no limit to the size of the tree that might be girdled. Most of the forests were then in the hands of Siamese traders, but about this time several European firms, notably Messrs. The Bombay-Burmah Trading Corporation, began to interest themselves in the Siamese timber trade, and bought up rights in teak forests all over the country. As the original owners in some cases sold the same rights to more than one firm matters soon became rather complicated.

The problems that confronted the Forest Department therefore at the outset may be enumerated as follows:—

1. To dispose of the various claims to the different forests.
2. To restrict girdling, and above all to put a limit to the size of the tree to be girdled.
3. To regulate the collection of revenue on timber when extracted.
4. To arrange for the disposal of the thousands of logs lying all over the country, both in the forests and in course of extraction, which through lax methods had not yet paid royalty.
5. To see that the new rules brought in by Royal Decree were carried out.

It is obvious that with such work before the Department and with a staff of officers at the outset not one-half in number of the present staff there was not much time to be given to such things as the selection and demarcation of reserves, fire protection and cultural operations. It must be remembered that all the work above referred to, which is either directly or indirectly connected with revenue collecting, had to be done entirely by the handful of officers appointed; there were no subordinates to assist in carrying out the work.

For the first four years it may be said the Department were engaged in the foregoing work. Claims were gradually settled, arrangements were made by which all the firms gave up their girdling right, though this did not take place until 1901, by which time enormous quantities of trees had been girdled over every leased area to ensure large stocks to work in the future.

New forms of lease were introduced, the principle of which was that each leased area should be divided into an open and a closed area usually of equal extent, that only the open area should be worked during the term of the lease, that no fresh girdling should be allowed during the term of the lease except with the express sanction of the Conservator of Forests, and then only if it should prove impossible otherwise to work up to the possibility of the forest. Further, if girdling was permitted it was to be carried out under the supervision of a Forest officer, and a limit of 9 kam ( $38\frac{1}{4}$ " ) in demigirth has been fixed as the smallest tree to be girdled.

The restriction of girdling and felling teak except under a lease ratified by Government, with all the conditions that appertain thereto, soon put a stop to a thriving trade in teak posts which was fast ruining the teak forests. The houses in Bangkok, all along the river and klongs (canals) which intersect the country in every direction, are all built on posts, and for this purpose it had been the custom to invariably use teak. In this way some 80,000 teak poles used to be consumed annually in Bangkok alone. The drain on the forests may well be imagined.

To regulate the collection of revenue a timber revenue station was opened at Paknambo, the point about 200 miles above

Bangkok, where the two main feeders of the Menam join and flow in one combined stream to the sea. With the exception of the Salween districts and those of Chiengrai and Chiengsen in the extreme north, these two feeders may be said to drain the whole of the teak area in Siam. For the Salween districts a revenue station has been opened at Kad, just above Moulmein, and for the Chiengrai and Chiengsen districts some point on the Mekong will have to be chosen.

Special arrangements were made with the largest timber firms by which they were allowed to pay the royalty on their timber only when it reached Paknampo, but petty traders were and are still obliged to pay in the forests before extraction.

This arrangement with the larger firms has simplified revenue collecting very much, but it could not be made use of for the thousands of logs lying all over the country, some without any owners, others with several claimants, most felled either illicitly or not in conformance with the meagre rules then in existence. The disposal of this timber gave the most trouble and occupied all the time of the Forest officers. This timber was so scattered that often a Forest officer would travel two or three days' journey to mark a dozen logs.

While doing this work he would distribute copies in the vernacular of the new rules regulating the working of teak and explain to the astonished villagers that a teak tree was no longer the property of the first person who liked to cut it down. Reporting and, if necessary, prosecuting for infringements of the new rules was a natural addition to his work.

This then, though I have given but the barest outline, was the work of the Forest officers for the first four years. As the people came to understand the rules better, and as more regular working was introduced, Forest officers were able to turn to other matters, the chief of which has been the mapping out of the teak areas, accompanied by reports on the growing stock supply of girdled timber, quality and quantity of natural regeneration, etc. As such a large percentage of the present staff are entirely untrained, these reports are seldom of much technical value, but they serve as a rough groundwork on which it is hoped something more useful may be built in the future.

The system of mapping out the forests (I avoid the word "survey" advisedly) is rough and ready, but with the enormous areas to be covered, and bearing in mind that there is only one map of the country of Siam on the scale of 1"=12 miles which can be made use of at all, and even that is extremely inaccurate, the results obtained are well worth the labour entailed. The plane table is invariably used, the scale being 1"=1 mile. In this way a continuous map of all the teak areas in the districts of Chiengmai, Lakon, Phra, and Nau is now in course of construction, the work gradually being extended as time allows.

Mapping out of forests and checking the marking of logs in eased areas by lessees, as according to the hammer used royalty is afterwards paid at Paknambo and Kado, are now the principal duties of Divisional Officers. But this ends it at any rate for the present.

I think I have said enough now to show how the Forest Department in Siam is hampered by the difficulties it has had to contend with, and with its dearth of officers has from very force of circumstances been compelled to turn most of its attention to revenue-collecting.

At the same time I hope I have made it clear that the present work is but the stepping stone to real forest conservancy, in which it is expected that demarcation, fire protection, cultural operations, etc., will each receive its due attention.

Although even now it is to be feared that more timber is extracted annually than the forest can well stand, very great limitations have been put on the work, and the state of affairs is enormously improved to what it was before 1896' when the teak forests were fast on the road to utter demolition.

PAKNAMBO, SIAM :

9th April 1904.

D. O. WITT,

Deputy Conservator of Forests,

### **Effect of Thinnings on the Growth of Coppice Shoots.**

The following is a free translation of an article on the above subject in the *Revue des Eaux et Forêts* for September 1903. There are considerable areas in India being worked as coppice (with or without standards) for the production of fuel and small timber. For example, in the Oudh Circle alone fully a quarter of the total area under sal is thus managed. It is therefore possible that a series of experiments carried out on the lines detailed below would yield very valuable results in a very few years' time :—

"The treatment of coppice is still the system most developed in France and of most moment in many estates. Unfortunately their yield is not so remunerative as formerly because of the considerable fall in the price obtained for small firewood, which has practically become unsaleable. It would therefore be a good thing to try and reduce the proportion of such small wood by increasing that of cord wood, as the average price of the latter has not fallen to the same extent. To arrive at this end, two methods present themselves, and might be continued : (1) the lengthening of the rotation, and (2) thinnings.

"Recent experiments have shown that in 20-year old coppice, by cutting out the weakened shoots, those left on the ground acquire, in the course of a few years, much greater dimensions in girth and height than those of similar coppice left

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untouched; that in consequence the former yield more billet and less faggot wood than the latter. Various observations point to the conclusion that the differences would have been still greater if the thinnings had been done earlier.

"To solve the above problem the Agricultural Society of France at their last general session decided to institute a series of experiments on the following lines:—

1	6
2	7
3	8
4	9
5	10

"In a coppice forest as homogeneous as possible both as regard light and density, mark off a sample area more or less square and divide it into two halves A and B by a central line, and divide these halves into four or five fairly equal plots by lines at right angles to the central line. Have thinnings in plots 1, 3, 5, 7 and 9, leaving plots 2, 4, 6, and 8 for purposes of comparison. In this way ample compensation should be provided for slight differences in light and stocking. Take care and operate only on the coppice shoots, and not to cut out any of the undergrowth. Calculate the volume and value of the contents of each plot, both of the stuff removed and of that left on the ground, keeping a note of the cost of the operation.

"This done, for the purpose of comparison of the actual rate of growth of the shoots in each plot (both thinned and unthinned), choose a number of stumps fairly equal, taken two and two, in the size and number of their shoots. Paint rings round the shoots at  $1\frac{1}{2}$  metres from the ground, red, say, in the thinned plots and blue in the unthinned ones. Measure the girths at these rings with a steel tape graduated to millimetres, and estimate for each stump the volume and value both of the shoots left standing as well as of those removed.

"Five years later, make a fresh inventory of the yield (in money and material) of each plot as a whole, and also of the ringed shoots in them. Measure the girths of the latter, and, by cutting down a certain number of them, ascertain whether the height growth of these in the thinned plots is greater or not than of those in the unthinned plots."

14th April 1904.

X. Y. Z.

## II.—CORRESPONDENCE.

**On certain important Forest questions.**

Mr. S. Carr in his letter under the above title published in the May number of the *Forester* appears to me to have made two statements which I think should not pass unchallenged.

On page 206 he says :—“It is claimed that fire protection has a very adverse effect on teak reproduction, and if this is so, *the longer the protection lasts and the more successful it is, the more accentuated will that effect become and the harder must be the struggle for teak seedlings that do appear.*” The italics are mine.

Now, is this so? I have no experience of Burma, but Mr. Carr will let that pass, and will permit me to ask if it is not the case that everywhere the first effects of fire conservancy are inimical to natural reproduction. Does it not favour the rapid growth of grass, shrubs and soft-wooded species more than that of the principal species? When, however, the fire protection is continuously successful for a sufficient length of time the conditions are altered. Does not then the dense growth of rank grass die down, and is it not then replaced by other finer sorts, which afford no obstruction to the germination of the seed, while the shrubby growth serves as protection to the young seedlings?

If this is so, then what is wanted is continuous successful fire protection. I have just been reading the last Burma Forest Report, and have been much struck by the marked absence, year after year, of continuous success in fire protection.

I see no prospect of being able to visit Burma and of obtaining direct knowledge of the effects of successful fire protection, but would beg Mr. Carr to allow me to offer him and some other Burma officers a suggestion which, though coming from India, may be worthy of consideration. Protect your forests *successfully* and *continuously* for a period sufficient to allow you to say definitely that fire conservancy has a lasting injurious effect on teak reproduction. Then, and then only, will it be time to treat us to those lengthy dissertations on fire protection which in the present state of affairs are purely academic, but which are none the less likely to have serious and far-reaching effects if, when too late, they are proved to be fallacious.

My remarks must not be taken to apply to areas where there is bamboo undergrowth in teak forests. Such conditions are not universal in Burma, I understand, and may possibly call for special treatment.

The second point where Mr. Carr seems to go astray is on page 207, where he states that “Most of us have suffered considerably in recent years owing to a number of senior officers having been transferred from India.” Mr. Carr must be aware that



Conservators are selected from the Imperial List, and such promotion does not depend on provincial seniority, and is the same for all provinces under the Government of India.

There have therefore of course been Conservators posted to Burma from other lists, but does not the removal for the same reason from the Burma list of Messrs. Gradon, Muriel, Jackson, and Carr far more than counterbalance this?

Has not also the Burma Service lately lost Messrs. Hill, Thomson, Burn-Murdoch and Hodgson; and of the Deputy Conservators transferred to Burma from India who remains now that Messrs. Manson, Hauxwell and Slade have gone on to the Imperial list of Conservators? Not one I think; and that being the case I will close with the remark that Mr. Carr in this respect might have endeavoured to substantiate his statement.

NON-BURMAN.

### **Wanted—A Research Bureau.**

I am anxious to have tested some teak timber grown in our most carefully protected plantations so as to compare it with that grown under ordinary conditions in Burma.

I am having a few squares cut in different localities, and should be glad to present them to any one who would take the trouble to put them through an exhaustive series of tests. It is possible that we are growing quite a different article to that which has made a name for itself on the timber market, but what it may have lost in one respect it has, we hope, gained in another.

A series of tests carried out over a period of years would be very instructive and remove a certain amount of uncertainty that now exists. My object in writing is to ask you or any of your readers whether you can suggest any person or firm whom I might ask to carry out the tests.

MAYMYO.

H. S.

We can only suggest Roorkee or one of the Railway workshops. —HON. ED.

### **Fire Protection and the use of Drums as Fire Alarms.**

In the April 1904 number of the "Indian Forester" under the review of the Burma Forest Administration is quoted a note on fire protection by Mr. Slade. He gives it as his opinion that fires under certain circumstances step in to help the forester in producing certain conditions in the forests which improve the chances of teak reproduction, and favour this valuable light-demanding species by reducing the chances of less valuable forest growth in the struggle for existence.

Mr. Slade appears to be not the only Burman forester who holds these views.

At first, the idea that fires are beneficial to forests comes as rather a shock to men who have only served in such very dry districts as the Deccan and Guzurath, and who have been brought up to the idea that fires in any case are one of the worst evils that can befall their forests.

"An Old Protectionist," writing in the same number of the "Indian Forester," points out the difference of the conditions under which teak grows in Lower Burma and in Guzurath.

We may therefore still be right in holding the opinion that though fires are beneficial to teak in certain regeneration areas of Burma, they have, on the other hand, the most damaging effect on both the prospects of natural reproduction and after-growth of teak in dry-zone forests. To my knowledge no trained officer has as yet challenged the theory that fires do harm in the dry parts of the Bombay Presidency, so taking it for granted that for the good of the forests fires have to be kept down in these areas, it remains to devise the best methods for doing so, and a few words on the methods adopted in the Panch Mahals may prove interesting to other Forest officers. Specially protected areas, well fire-traced and divided into sufficiently small fire compartments, with fire watchers, have been introduced in this division. Such precautions reduce the extent of any one fire to certain limits. To check the number of fires the villagers have from time to time had their privileges suspended. These are all good measures, and I fancy are used in nearly all districts.

A former Divisional Forest Officer when in charge of this district, however, found that in spite of fire tracing and fire watches the areas burnt were often large, owing chiefly to delay in assistance being procured from the villagers. In order to overcome this difficulty he introduced a system of collecting the villagers by beat of drum. The system consists in providing each fire post and each large village in the vicinity of forests with a kettle drum. The fire guard or village headman who is in charge of a drum has to beat it when he sees a fire near or in jungle. The fire guard at once proceeds to the scene of fire, and there beats a quick tattoo on his drum, on hearing which or seeing smoke rising, the village drum is beat at slower intervals to collect the people. As the huts of the villages in these parts are often far apart, the beating of the drum not only gives the alarm but collects all the villagers at once to the patel's house, and they then proceed in the direction of the smoke or sound of the fire guards' drum. The fire guards keep up the drumming after the people have begun to collect to call stragglers all to one place.

This method of giving the alarm and collecting assistance by beat of drum has much to recommend it. The sound of these large kettle drums can be heard a long way off, so that the usual excuse so often given by villagers that they did not know of the fire is

overcome. It also has the advantage of collecting the whole force to one place, and so facilitates the concentration of all the available energy to the most dangerous parts, an important factor in the success of the operations. The order that the fire guards should continue drumming when most of the people are collected might seem waste of energy, which might be directed in a more profitable way. However, as most officers who have seen fires must know, the moment to attack a fire and beat it out is when there is a lull in the wind, and before this moment has arrived the people are generally standing away from the line of fire, having been driven back by the flames. The general practice in this division is for the fire guard to give the word when he thinks the fire is low enough to be attacked, and with a yell he beats his drum and urges the people on to fresh efforts. This may sound rather sensational, but over and over again have I seen the people urged on to a sudden rush, with combined effort, and final success by giving them the order by beat of drum, when stimulation by word of mouth would not be heard and have little effect. I am unaware if this system of drums is in force in other districts except Surat and the Mahals; if not, it might be considered by other officers, and I feel sure they will find it a success.

Before leaving the subject of fire protection, I would venture to draw the attention of my brother officers to a book on the subject called "Incendies en Forets" by A. Jaacquot, Inspecteur des Eaux & Forets, published by Berger-Leorault & Cie, 18 Rue des Glacis, Nancy, France. I do not know the author, but his treatise contains much of interest in it for Forest officers which would apply to India as well as to France.

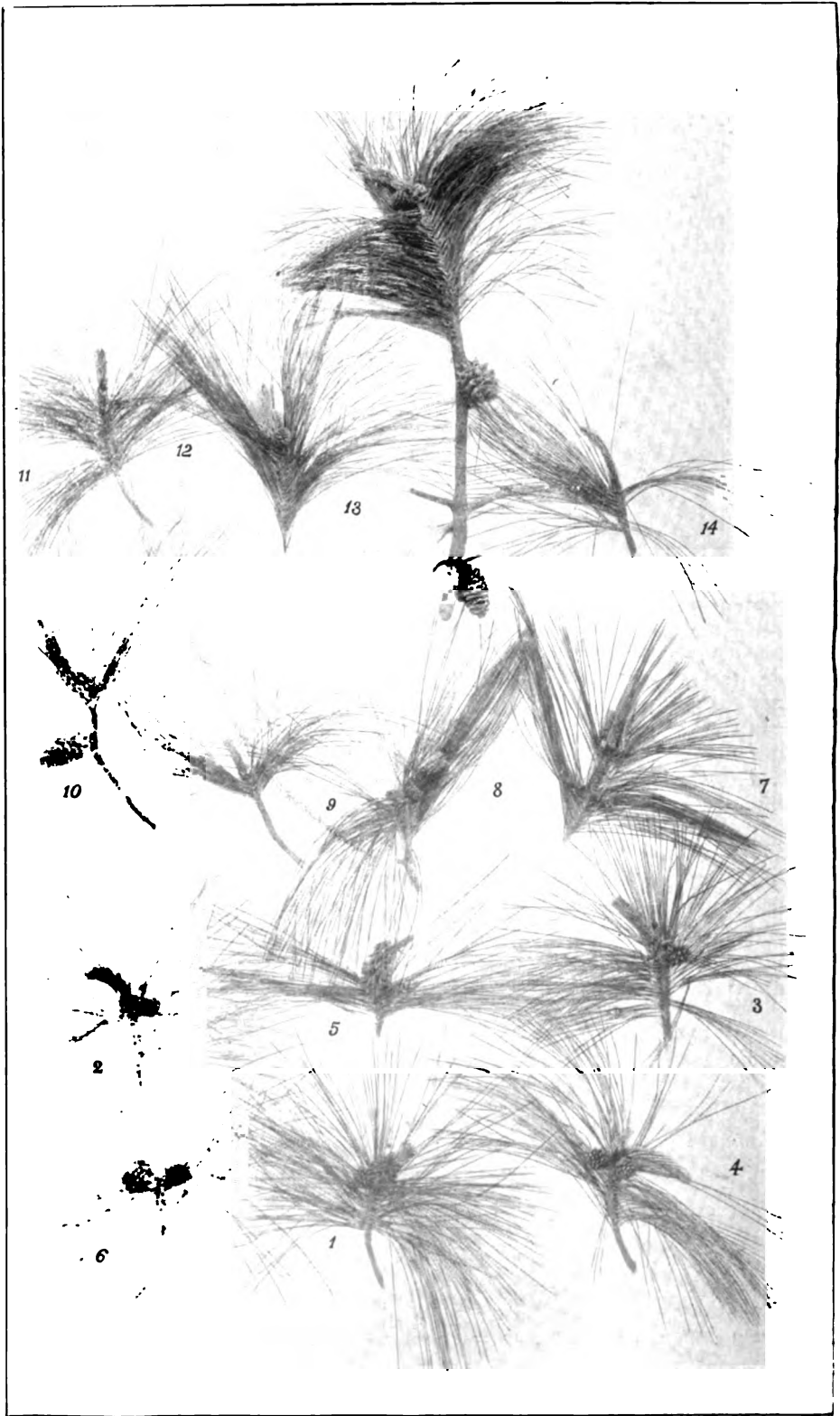
RALPH S. PEARSON, I. F. S.

### The Ripening of Cones of *Pinus Longifolia*.

I should feel much obliged if you would kindly allow me a little space in the "Indian Forester" for the following note on the "Ripening of Cones of *Pinus Longifolia*," which is based on actual experiments carried out by myself.

At the beginning of July 1903 I had commenced to make observations on the ripening of the cones of chir pine, so as to enable me to reply in more detail to an article published by Mr. E. M. Coventry in the July number of the "Indian Forester," page 276; although I wrote on the same subject in September 1903, I was then not able to express myself clearly since the article above alluded to was written on some observations made many years ago. I am now, however, able to illustrate my argument practically by the aid of photographs taken, representing the





various stages in the development of the cones. Figure 13 shows the cones formed year before last, *i. e.* (1902, 1903 and 1904). Similarly figures 1, 2 and 3 illustrate the fertilized cones; lately formed, coming out from among the male catkins. Figures 4 and 6 show the fertilized cones, about 15 days old, with the male catkins falling off.

This is practically a further development of that shown in figures 1, 2 and 3. Figures 11 and 14 illustrate the small unfertilized cones of this year on the tip of the flowering stalk. Figure 12 shows one large fertilized and two small unfertilized cones of this year. Figures 8 and 9 show clearly the intimate result of these small unfertilized cones of last year which were originally formed on the tip of the flowering stalk. Figure 7 shows the same unfertilized cones of the year before last. Figure 10 represents a branch which was taken off from the tree in September 1903, and shows one unfertilized cone of March 1903, and the other large fertilized cone of March 1902.

Figures 1, 2 and 3 fully illustrate that the male and female flowers appear on the same shoot. The female flowers at the base of the flowering stalk are only fertilized, and the growth of the cones after fertilization is so extremely rapid that it would seem almost impossible to believe that the cones shown in figures 1, 2 and 3 are about a week old and  $1\frac{1}{2}$  inches long, while those in figures 4 and 6 are only about 15 days old and 2 inches long, that is to say, the growth in the one case is  $\frac{1}{2}$  inch more than that of the other during a period of 7 days.

Figure 13 shows that the distance between the cones produced each year is 14 inches; the question is then how is it possible that the cones on the top of the flowering shoot and those at the base of the same flowering shoot, a distance of  $4\frac{1}{2}$  inches, are formed in two different years. That is the cone at the base fertilized this year and the two cones on the top will be fertilized next year, which seems to me impossible.

Figure 8 also shows that there are some leaves between the cones of last year and the flowering shoot of this year, and hence separating the cones of the two years.

I will also add that the female cones require a large quantity of pollen to fertilize the numerous ovules, and therefore the cones at the base of the flowering shoot are readily fertilized, while, on the other hand, those on the tip of the flowering shoot cannot get fertilized owing to not receiving sufficient pollen. The male catkins being situated below them, and when the pollen is shed it naturally falls to the ground, and the pollen from other flowers is so distant that it becomes impossible for them to receive the required large quantity. I have not observed any insects on the flowers that might possibly cause fertilization, and the resinous matters exuding from the cones is so very sticky that any insect coming in contact with them would probably get caught for good.

Now suppose if cones are produced this year and are fertilized next year by new catkins, the distance between the two, as already explained, would be about 14 inches (see figure 13), which is to my mind too far to allow of proper fertilization. On the other hand, in case they be fertilized in the same year as they are produced, there is no reason why they should turn hard and brown the first year, and again green and soft the following year and continue to grow, reaching in a month or so to their full size. It is generally a rule that if any fruit is formed it grows regularly to its full size without any intermediate obstruction such as would happen in this case.

Since July 1903 I have observed that many of the small cones which were green on the shoots have fallen, while others which still remained on the shoot have now turned black, brown or red, and have not, under any circumstances been transformed into green living cones and become fertilized as was supposed, *vide* figures 7, 8 and 9.

Observing again in February 1904, it was found that all the shoots of *Pinus longifolia* had a terminal bud which expanded and produced either male catkins or else both male and female flowers on the same flowering stalk as is seen in figures 1, 2 and 3, where there are the fertilized cones at the base of the flowering stalk, and consequently the growth of the shoot is not checked, and it continues to grow, producing needles on the new shoot. On the other hand it will be seen from figures 8 and 9 that the growth of the new shoot has been checked by the cones formed at the top, and in consequence the immediate production of side shoots becomes necessary, which in turn produce flowers, but do not fertilize the cones of last year, which, as already explained, have become hard and unfit to receive pollen from this year's catkins. Many of these small unfertilized cones formed at the summit of the flowering stalk are already drying and falling off, and it is very probable that many of them drop within a month or two, while a few others remain persistent for over a year, just as the ordinary fertilized cones do; however the exact period is not known yet.

I further observed that while searching for those small cones to record their growth on a tree in the Forest School gardens in September 1903, it was quite impossible to perceive any. On looking again on the same tree on the 10th March 1904 I found a number of cones which I could not account for, the only reason being (as I have already proved) that the cones of *Pinus longifolia* are produced and fertilized in March, and they then grow to their full size in a month or two, and becoming mature in next May, as already stated.

Mr. E. M. Coventry has written in the "Indian Forester" for December 1903, page 573—"Last year's shoot terminates in a bud. In March or April this bud expands and develops into a shoot, which bears at or near its extremity the young cone.

When the shoot has expanded to its full length it is found to be terminated by a bud round which the young cones are situated." (The male cones are situated on and around the lower portion of the year's shoot, and drop off soon after they have shed their pollen. Male and female cones do not of course occur on the same shoot.)

Figures 1, 2 and 3 will clearly show that male and female flowers are on the same shoot in Dehra Dun.

DEHRA DUN :

Dated 18th March 1904.

BIRBAL.

### Germany and America in Forestry Methods.

In the April number of the *Indian Forester* I have read a note on the part which Germany or rather the Forest Service of Germany are going to play in the World's Fair, which was opened a few days ago in St. Louis. The note interested me as I had just returned to Berlin from the Forst Akademie at Eberswalde, where I had been shown and told many instructive things and been received with great courtesy by Herr Oberforstmeister Riebel and Professor Dr. Karl Eckstein of Forst Zoologie Jannr.

Herr Oberforstmeister Riebel, an officer of long mature experience who now holds the position of Director of the Eberswalde Forest Akademie in Prussia, and is also the Administrative head of the Forests of Eberswalde and Frienwalde, has been deputed by the German Government to the St. Louis Fair in connection with the Forest exhibits and operations to be carried on there. The Oberforstmeister was greatly looking forward to the visit from which he hoped to cull some interesting information of use to his own department at home. Probably one of the reasons for this officer's selection was due to the fact that for the last 15 to 20 years they have been experimenting with exotics in the forests of this part of Germany with a view to seeing whether they cannot grow the kinds of wood now imported in fairly large quantities from North America, and to some extent from, I believe, Japan.

In the Frienwalde Oak and Beech Forests I was shown a considerable number of plantations consisting of various exotics, and in many instances the growth was quite remarkable. One cannot but wonder whether with this rapid growth, the wood will be equal in quality to that imported. To give an example, I saw a young plantation in which the *Quercus-Americana* trees were a third to a half again as high as the *Quercus robur* with which the species had been planted in alternate lines. Excluding a number of exotics, which are only of use as ornamental trees, I was given the following list of trees, from which they are of opinion it will be possible to form forests: *Pseudotsuga Douglasii*, *Picea Sitkensis*, *Pinus strobus*, *Chamaecyparis Lawsoniana*, *Picea Menziensis*,



*Quercus rubra*, *Q. Americana*, *Robinia pseudoacacia*, *Careya arborea* (I saw some wonderful young hickory plants), *Juglans nigra*, all from North America, and the Japanese *Larix leptolepis*.

The woods imported from North America are chiefly *Pinus palustris* and *P. Australis*, *Juglans nigra* and *Careya arborea*.

I trust I shall be able to give or get himself to give in the pages of this Magazine some account of Herry Oberforstmeister's experiences and opinions on America and American forestry.

I understand that a Forest Conference will be held in St. Louis in August or September. It is probable that an Indian Forest Officer were he deputed to visit St. Louis would be able to obtain much information of value to his Government and Department. The Germans evidently expect to.

ST. PETERSBURG :

E. P. STEBBING.

19th (2nd May) April 1904.

### Reproduction by Sucker Shoots.

In his article in the April number of the "Indian Forester" Mr. A. W. Lushington suggests that the old term "root sucker" should be replaced by "sucker shoot," on the ground that roots never produce leaf-buds, whereas these stems arise from lateral superficial roots, which are really underground branches. I do not think "sucker shoot" is much of an improvement. These underground branches are to all ordinary intents and purposes roots, and it would surely be admissible to call the stems arising from them "root-shoots." The term would be simple, and would neatly distinguish them from "stool shoots."

The subject of Mr. Lushington's article is very interesting and his suggestions are perhaps capable of being worked out with valuable results. The matter is passed over very lightly in Forest Manuals, this being perhaps due to the fact that our manuals have so far been concerned only with European species, of which the more valuable do not appear to produce these shoots. It is different in India judging from Mr. Lushington's long list of good species which give root-shoots.

We spend much labour in coppices in trimming shoots to produce stools, which then come up in a crowd at one point, leaving the spaces between the old stools bare, as before. If the lateral roots were systematically sought out by a light scratching of the ground we should possibly be able to do a good deal towards filling in these intervals between the old stools, and to space the new stems as we pleased, and this, in thin coppices, on poor exposed soils, would be of value. Mr. Lushington intimates that this has been done successfully, but only on a small scale, I gather, but I think the system is capable of considerable development.

There are often in high forests as well as in coppices bare hard spots upon which it is difficult to get up a growth of seedlings. Here we might hunt up the lateral roots of trees bordering the

blanks, and induce a growth of root-shoots. That this plan would be successful with certain species is likely, since Boppe says (*"Traité de Sylviculture"*): "It has been noticed that root-shoots are produced by preference on the roots of isolated trees, or, after the felling of trees, on a soil exposed by an exploitation to a full light."

This tallies with an experience of my own. Some years ago I clear felled (or nearly clear-felled) a piece of Shisham forest with the immediate result, not only that there was a tremendous growth of stool-shoots, but also that a number of stems appeared in the intervals between the old stools. These items were, I imagine, root-shoots though unfortunately I omitted to make certain. I am, however, practically certain, for I feel sure no seedlings could have developed as rapidly as these stems did.

In the case of Shisham it would thus appear that the development of root-shoots at a distance from the stool in no way interferes with that of stool-shoots, but this may not be the case with other species.

It would, however, perhaps not be wise to induce such reproduction on too large a scale in a high forest if it is really true that the longevity of a tree sprung from a root-shoot is smaller than that of a tree from seed. Still we have Bagneris' authority for saying that "suckers have a better future before them than stool-shoots, inasmuch as they have their own roots, and are therefore independent." Also suckers are rooted directly in the soil and are hence independent of the parent stool from the very beginning. (*"Translation of Messrs. Fernandez and Smythies."*) Boppe says: "The root-shoot frees itself easily from the parent root, to form an independent stem; better than the stool-shoot, it assures the reproduction and expansion of the tree; nevertheless its longevity remains attenuated by the original fault common to all trees starting from an axis."

As a wound will induce the development of the buds I would slightly graze the upper (or perhaps preferably the side) surface of the exposed root. Also probably a small root would be better than a large one, as being less likely to introduce rot into the new tree.

In this connection we may quote Mr. Fernandez's *"Rough Draft of a Manual of Indian Sylviculture."* He says "in the ground wounds are not at all necessary for the formation of these (adventitious) buds, although they of course continue to be an exciting cause. Adventitious buds on roots are the sole origin of suckers and are produced most abundantly on or near swellings, which prove the greater activity of the cambium there."

Boppe says (*"Traité de Sylviculture"*): "It has been stated that lesions made on the lateral, superficial (*traccantes*) roots of certain species, ordinarily little inclined to form root-shoots, may provoke the formation of such shoots."

DEHRA DUN:  
11th April 1904.

A. G. HOBART-HAMPDEN.

### **The Review of Forest Administration in British India, 1901-1902**

I have been awaiting with interest your reply to Mr. C. P. Fisher's letter on your Review of the Forest Administration during 1901-1902, but you do not seem to have taken his remarks to heart, and I am therefore constrained to make a few remarks myself in defence of your review.

Mr. Fisher complains you have implied words to the Government of the Central Provinces which were never uttered. I myself cannot see in your review any mention of the Central Provinces Government having made any comparison of their own province in the preparation of working plans with that of other Provinces. That is the last thing one would have expected them to do in view of the backward state of matters in connection with the systematic working of the forests in the Central Provinces, and I very much doubt if you meant to imply that any such comparison had been made.

Mr. Fisher further shows in detail how the Government of India impressed on the Central Provinces Government the grave necessity there was for hastening the compilation of such plans as were necessary for the systematic working of the forests in the Central Provinces. Having shown this clearly, Mr. Fisher appears to think the Government of India are now opposed to the compilation of working plans in the Central Provinces. I have no knowledge of the views of the Government of India on this point, but I am inclined to venture the opinion that the Government of India hold no such absurd views, but are strongly averse to the compilation of paper schemes, which have been found impracticable, and the production of which is no criterion whatsoever of the progress being made in forest administration. The blame for the production of such schemes would appear to lie, not with the Government of the Central Provinces, but with the Conservators who permitted their compilation.

We may now expect to have working schemes drawn up in the Central Provinces with more attention paid to the realities of everyday life, and there will then consequently be even less need for your "didactic criticisms."

RUSTICUS.

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### **Our Neglected Commercial Side.**

In his letter of the 23rd November last, published in the April issue of the "Indian Forester," Sir William Thisleton-Dyer has shown that my short note under the above heading in the November (1903) issue is apt to convey an impression far

removed from that I wished to create, and I therefore crave further indulgence.

In no way do I wish to impute general neglect of the commercial value of 'Bhabar' grass in India, as I am well aware that a very considerable revenue is made in some forest divisions from this source, as is indeed obvious from my previous remarks.

All I wish to enforce is that with a central information such as advocated in the issue for June 1903 repetition of unsuccessful attempts like mine of last year would be avoided.

What was required when the experimental exploitation was begun was not to ascertain whether Bhabar grass is fit for paper-making but to obtain data as to the exact comparative value of the local product, cost of exploitation and of transport to the railway, and thence to the factories, and finally whether prices obtainable were remunerative.

Patently special figures must be worked out for each division owing to the varying cost of labour, means and distance of transport, etc. Here in Ganjam the grass has to be carted on an average for 50 miles to the railway, and thence the distance by rail to the nearest factory is about 400 miles.

The actual experiment carried through last year was not absolutely fruitless as useful information was obtained. However, had there been some record of the previous experiment readily available, the later one would have been on modified lines. It may be urged that the result of the experiment of 1886 should be forthcoming in the old records, and so they are to a certain extent; but firstly the present establishment was quite unaware of its ever having been made, and secondly in those days office records were not very systematically classified or carefully kept.

What was aimed at in the original proposal for a central information bureau, and what I would still insist on, is the necessity for some special branch being made responsible for dealing exhaustively with each article of forest produce, for collating and making readily available all necessary data for its exploitation in each division, and for providing every facility to divisional officers in placing forest produce on the best market.

CHATRAPUR, GANJAM:  
20th April 1904.

C. E. C. FISCHER,  
Deputy Conservator.

### III.—OFFICIAL PAPERS AND INTELLIGENCE.

#### Road-side Arboriculture in India.

Anyone who has done much camping in the plains of India could not fail to be impressed with the thoroughness and success with which district officials of past days have converted glaring and

dusty roads into cool and shady avenues, which not only added very materially to the beauties of the landscape but conduced greatly to the comfort of the weary traveller in the hot weather. These avenues are especially noticeable along the old trunk roads, and on branching off on to one of the more recent side roads the wayfarer is at once struck by the equally conspicuous absence of such avenues or by the want of success which has so frequently attended the generally desultory efforts of more recent days.

We are glad to learn this is receiving the attention of the Government of India, who have asked Local Governments to furnish them with information as to the steps taken in recent years to plant new avenues and to maintain already existing ones. With the object of establishing a more sustained and uniform policy, not only for the development of new avenues, but for the preservation and renovation of old ones, they have also asked for suggestions for the improvement of the existing system, especially with regard to such matters as the issue of general instructions in the form of a manual of arboriculture, the preparation of well-considered programmes, and the training of a supervising staff.

For some few years back the Punjab Government have been taking some steps in this direction, and have been occasionally sending a few men to undergo a short course of practical arboriculture at the Imperial Forest School, Dehra Dun. We cannot help thinking, however, that no such training is necessary nor is a manual of arboriculture indispensable. In past days they managed to make admirable avenues without trained men and without a manual, and there would appear to be no valid reason why this cannot be done at the present day *if the money is forthcoming.*

This seems to us the *crux* of the whole matter. Now-a-days the money is wanted for sanitation, for education, for hospitals, and for a dozen other purposes which have first call when money has to be allotted for local expenditure, with the result that "no money is available for avenue planting this year; it must stand over."

If the money is provided, and if, as seems to have been done in former days, the tehsil authorities are made responsible for the avenues within their limits, there should be no difficulty in maintaining and extending our avenues. To be sure the native will continue to put two or three plants into each hole, but he has done this all along, and it has succeeded, and it is very doubtful if he will discontinue the practice in spite of what the Manual says.

Be this as it may, the steps now being taken by the Government of India cannot fail to be productive of much good, even if they result in nothing further than drawing the attention of Local Governments to the fact that they are conspicuously failing where their predecessors succeeded so admirably.

### Coopers Hill College.

The correspondence between the Government of India and the Secretary of State with regard to the closing of Coopers Hill College has now been published. It will be remembered that a Committee, of which Sir Charles Crosthwaite, Doctor Jex Blake, the Dean of Wells, and the late Head Master of Rugby School, Mr. Hardie, a Member of the India Council, Sir Alexander Rendel and Mr. Leonard were members, was appointed to enquire into the necessity for retaining the Government Engineering College at Coopers Hill.

We have not the report of the Committee before us, but understand that the Committee unanimously recommended that the College should be closed, and suggested in detail a system by means of which the recruitment and training of Public Works and Forest Officers might be carried on without the provision of a Government College for the purpose.

In expressing their views on this report, the Government of India remarked that,—“So far as the question affects the Forest Department, we would point out that, though the number of recruits is small, only about eight a year on the average, yet the question of their training in the interests of our Indian Forest establishment, which is annually increasing in importance, and requires for its development, not only professional skill, but a high degree of administrative ability, is one of great importance.

“As regards the advantage to the general tone and status of the service, which accrues from bringing its future members together under discipline for some years at an institution to which they may feel proud to belong, all that has been said above applies to the Forest Officers with the same force as to the Engineers. In the matter of professional training, however, the two services stand on a somewhat different footing. There are no schools of forestry in England, nor does the country afford any opportunity for that practical training which is especially essential in the case of officers who, joining a department that is always short-handed, are posted at an early stage in their career to isolated and independent charge. In this respect we consider the present system to be defective, and we adhere to the opinion expressed in 1882 and 1884 that the system of continental training which was then abandoned in opposition to the strongly expressed views of the Government of India was superior to anything that is possible at Coopers Hill, in so far as professional training is concerned. Regarding the question as a whole we are content with the existing arrangements, which we have no desire to disturb. But if Coopers Hill College is to be closed we would strongly urge a reversion to the system which obtained before candidates for the Forest Service were admitted to that College, though we think that the arrangements then made for the supervision of the students while abroad were defective, and that more effective provision in that respect will be required.”

The Government of India concluded its observations on the Committee's report by recommending unanimously that the College be maintained for at any rate a further period, and stated that the opinion of the heads of the three departments interested in the matter was strongly in favour of the College being retained.

Notwithstanding this strongly expressed opinion the fiat has now gone forth that the days of the College are numbered. Officers for the Public Works will be recruited from students of all the chief schools of Engineering in the United Kingdom, and from the information given in the Secretary of State's despatch with regard to the method of recruitment during the next three years, we understand that the closure will take place at no distant date.

As a further communication is to be made with regard to the professional education of selected candidates for the Forest Department it would appear that the suggestions of the Committee with regard to the recruitment and training of Forest Officers have not been similar to those expressed by the Government of India, *viz.*, that a reversion should be made to the system which obtained before candidates for the Forest Service were admitted to Coopers Hill College.

The Committee can hardly be described as a strong one from the point of view of knowledge of the attainments requisite for a Forest Officer, and with the exception of Mr. Hardie, we doubt if any one of them has any practical acquaintance with the requirements of the Forest Service in India. Some few months ago we ventured to throw out a suggestion for the future training of Forest Officers in case Coopers Hill were closed. This in no way runs contrary to the opinion expressed by the Government of India, and we think a scheme somewhat on the lines already sketched by us will meet the requirements of the case much better than would any attempt to train the candidates at one of the British Universities.

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#### IV.—REVIEWS.

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#### **Progress Report of Forest Administration in the United Provinces for 1902-1903.**

The Forest Report for the United Provinces for 1902-1903 furnishes a remarkable lesson to those Administrations whose yearly custom it is to impress on their officers the necessity for economy, and for the avoidance of any expenditure which will not forthwith produce a *direct* equivalent in the shape of an increased surplus.

It is only a year or two ago since a Local Government by dint of much pressure and persuasion was induced to sanction a fairly large experiment in the shape of a departmental supply of railway

sleepers from areas which, though possessing large quantities of good timber, were practically unworked owing to the absence of any serious demand. What was the result? Through want of experience difficulties were met in carrying out the contract, accidents happened, unforeseen events occurred, money was spent unnecessarily, and the ordinary work of the establishment was disorganised. Still the material was supplied, *but* the undertaking was not the financial success anticipated, and the order went forth it was not to be tried again. This meant that the experience gained was absolutely thrown away. Had the work been continued, with the experience obtained it could have been done 20 per cent cheaper, infinitely quicker and without any serious impediment to the ordinary work of the staff.

If we turn to the report under review we find a very different policy in force.

We find a province with a total area of only 4,071 square miles of Reserved and Leased forest, but provided, at an annual cost of Rs. 3,55,000, with an establishment which is unique in India, and which is the envy of every Forest Officer outside those provinces.

Turn to what head we may, we see the consequence of this liberal-minded policy in connection with the maintenance of an adequate establishment. The whole of the forest boundaries are demarcated with the exception of 186 miles, of which 146 miles are situated within one hill division, where at present the demarcation cannot be effected.

There are only 379 square miles of forest in the provinces for which no working plans have been prepared; of this area 303 square miles are dealt with under a rough working scheme, which is considered sufficiently elaborate for present requirements.

Rupees 52,000 were spent on roads, and the Government in reviewing the report insists on still larger expenditure in districts where the forests require to be still further opened out in order that they may be properly exploited.

On buildings Rs. 57,816 were expended, the greater part, Rs. 39,000, being spent on new buildings. Anent this expenditure the Government remarks are :—"Here also, however, more liberal expenditure is required. Life in the forests is hard, and the climate is often unhealthy. Without suitable accommodation it is impossible for the staff to keep in health and to work properly." On this the Government of India state that they "are in entire agreement that expenditure incurred on improving communications and supplying accommodation for the subordinate staff is well justified in the interests of efficient forest management."

Space prevents us from giving further evidence of the liberal policy adopted in these provinces, and we will conclude by a reference to the financial results of the year, a form of argument which appeals even to the densest of intellects. The



total receipts amounted to Rs. 21,66,528 and the surplus reached the handsome figure of Rs. 11,43,367. This means that the surplus was almost 53 per cent of the gross revenue, a proportion which we believe has not hitherto been reached in any other part of India.

### **Mahogany and other Fancy Woods available for Constructive and Decorative purposes.**

BY FRANK TIFFANNY.

In the Journal of the Society of Arts for February 26th, 1904, there is an interesting paper on the above subject, which was read by a Mr. Frank Tiffany at the Eleventh Ordinary Meeting of the Society. The paper was not confined to woods, but also contained some remarks on the importance of forestry, and though in these there was nothing new, they are yet of value in spreading the knowledge of the necessity of the maintenance of forests. Mr. Tiffany is only following a beaten track when he says that it is "an undoubted fact that our modern requirements of timber are depleting the world's forests far in excess of natural reproduction," and he is far from the truth when he says that "as yet practically nothing is being done to conserve or reproduce what is to man as vital as even food supplies." All civilized nations are now taking steps to preserve and maintain their forests, and practically all our Colonies, even those of most recent establishment, are following the same lead. It is true though that in Great Britain itself little has yet been done, and that much could be done, but not to the extent that Mr. Tiffany considers possible. Thus according to Mr. Tiffany "if we are to maintain our industrial supremacy something must be done to inaugurate an extensive and scientific system of the re-afforestation of the United Kingdom and Ireland with such timbers as experts may agree upon as being likely to thrive," and he states that "it would be a kindness to compel the inefficient to return to the land, and find them employment in forestry." This is stating the case much too broadly. The amount of timber that could now under the best of circumstances be grown in the United Kingdom and Ireland could bear but a relatively small proportion to the amount annually required, could only become available after about 80 years, and could not appreciably affect our commercial position; but re-afforestation of waste areas would add to the wealth of the country by making idle lands productive and cheapen the price of timber for home consumption. In talking of the "return of inefficient to the land" he descends to claptrap. This may be a good ~~ory~~ in the interests of agriculture in general, but forestry would afford little employment for such labour. As regards the woods available for constructive and decorative purposes Mr. Tiffany states that "our object must be to learn the special characteristics of those which enterprise and modern

transportation have placed at our disposal, and whilst, however imperfectly, enumerating the purposes for which each is peculiarly adapted, it is essential not to hold a brief for any.....“ But Mr. Tiffany fails to act up to this ideal, and his paper distinctly favours mahogany, on the qualities and value of which he discants to the extent of three columns of print, whilst oak is only accorded a column and a half, and teak a miserable half column. The descriptions of 37 other woods are contained in four columns, and these include the important Australian and Tasmanian woods.

The salient features of what is required of any fancy wood are summarised as follows:—“Hardness of surface, but it must not be of such hardness as to render it potty, or brittle, so as to be difficult to tool: evenness of texture, that is, an absence of undue variation of alternate layers; cohesion of fibre along with an absence of resinous galls. It is also necessary that the wood should season more or less readily without a tendency to tear itself into shreds, or to twist and warp when seasoned, nor should it swell and shrink with every slight variation of atmospheric conditions.....Colour should improve with age; it militates against value when they fade, go black or become lifeless. Also in cabinet-making any wood which will not take glue is worthless.”

Mr. Tiffany mentions mahogany, oak and teak as the three leading fancy woods, but exception may well be taken to the inclusion of oak and teak in such a designation. He states that mahogany if placed first must not take that place to the disparagement of either oak or teak. “The commanding position of mahogany is not due to any freak of fashion, but to its own intrinsic merits, along with the abundance of supply.” No attempt is made to prove these assertions, and all that is said in praise of mahogany might equally well be said of oak and teak, or of some other woods, and as regards the abundance of supply, it is probable that quite as much teak is put upon the market as mahogany, but its area of utilization is larger. India absorbs enormous quantities of teak in construction work, and every maritime nation employs great quantities for naval construction. Mahogany, it is stated, was formerly principally obtained from St. Domingo, Cuba, Honduras, &c., but the quantities shipped from central American ports are now diminishing, but are compensated by the development of the African mahogany business. This mahogany comes from West Africa, Tabor, Benin, Oricus and Assinee principally. Asiatic and Australian mahogany are lightly esteemed. Of oak and teak Mr. Tiffany has nothing new to relate. The following reference to teak is, however, somewhat amusing: “Had this wood been available when Solomon built his temple at Jerusalem, probably with his wealth he would have preferred it to the cedar of Lebanon: it is however used in the pagodas of the East, and as a preferential treatment to our greatest dependency it is hoped that it will be the one wood used throughout

in the building of the great cathedral of Liverpool." Evidently Mr. Tiffany esteems teak for its sacred character, and he is not free from the fashionable complaint of Fiscalitis. At the conclusion of his paper he says "whatever may be the outcome of the present fiscal inquiry, it is sincerely to be hoped that the products of the forests, especially tropical (as they are essentially our raw materials), will be accorded the most favoured clause, if not admitted absolutely duty free."

Of the other 37 kinds of fancy woods mentioned by Mr. Tiffany in a few lines of description of each, the majority are of only academic interest to the "Indian Forester." They include only three woods obtained from India, *viz.*, Black Ebony, Padouk and Rosewood. Of Black Ebony he states that it is "highly suitable for small ornamental work..... veneers and mouldings in relief." Of Padouk, that it is of a deep red colour which fades from exposure. It will not take glue. When wrought it stands well, but it is costly to manipulate. When extreme hardness is required it makes a good countertop, but the general run of lengths are too short. It is also a splendid wood for gun carriages, &c." Rosewood is dismissed with a brief description far incommensurate with its value. "Thirty years ago it was considered a first class drawing-room furniture wood, but it has fallen into disfavour, although it is still used for pianoforte cases. As a wood it is costly and the size small, and is difficult to work. When newly worked it possesses a dark and frequently richly variegated figure, but fades with age, becoming very lifeless. As a moulding wood in relief it is very effective." Mr. Tiffany is evidently unaware of the fact that this wood has been adopted in India by the Ordnance Department for gun carriages. Gun carriage factories have taken 80,000 cubic feet of this wood in the last three years from the North Canara forests alone.

The two Australian woods, Jarrah and Karri, of which so much is heard now, get very scant notice from Mr. Tiffany, and both are damned with faint praise. Of Jarrah he says that it is "a hard dense wood of no beauty in appearance: considering the large size to which it grows it is a pity that its uses in this country do not appear to be available for much beyond that of a paving material, for which it is undoubtedly fitted." Of Karri, that it is "a similar wood to Jarrah, but of much greater tensile strength: to a small extent it is being used for the underparts of rolling stock; but whether it will be found to possess or retain that flexibility so characteristic of oak remains to be proven; and its great weight adds materially to the dead load of the train. There is nothing in its appearance to commend it for general purposes." Mr. Tiffany omits all reference to the main purpose for which these woods are being employed, *viz.*, railway sleepers, and also of the extent to which they are imported into England and absorbed there or re-exported. He is also quite wrong in his description of their appearance. Both woods are capable of taking

a very fine polish. At the Glasgow Exhibition of 1901 a large space was occupied by an exhibit of furniture, &c., made from Karri and Jarrah woods, including a very handsome staircase and hall decorations. Mr. Tiffany has much to say about the introduction to the market of new woods. He refers to Mr. Gamble's lecture at the Royal Colonial Institute, where he spoke of the difficulty of introducing new woods, and adds his testimony to this; but he does not convey much encouragement to those who might wish to introduce new woods. The following remarks are quoted as being of interest and instructive, though not containing anything particular of novelty.

"The carrying of seasoned stocks of recognized fancy woods is itself a heavy tax on capital without loading it with an unknown and unproved wood, and if a merchant takes a risk he has no guarantee as to the continuity of supply at a price which would enable him to compete with recognized stocks.

"The introduction of new woods involves a considerable amount of missionary enterprise which rightly should belong to those whose interest it is to secure their introduction and acceptance.

"It is, however, futile to send here unlabelled samples which brokers cannot classify, and consequently give them such unmeaning names as "fancy woods" or "furniture wood," and hence they are frequently auctioned at prices which do not cover freight and charges.

"If a wood is worth sending it should have proper foster parents, who can give the trade some idea of the quantity available and the more important question as to the continuity of supply and the cost at which it can be placed on the market."

A discussion followed the reading of the paper at the meeting of the Society, but nothing farther of interest was elicited.

## V.—SHIKAR AND TRAVEL.

### The Long Round to England.

#### PART III.

*Canadian Forests: Their Importance.*—We turn now to Canada. And first of all we must say that any forester who visits the Dominion is certain of receiving a warm welcome. The writer was unfortunate in only being able to spend a few days in the Provinces of Ontario and Quebec, but to travel at all thoroughly through these countries in four months is more than health, wealth or time would permit. In those few days however much interesting information was given by the Forest authorities and others interested in the subject, information which is probably as new to readers of the *Indian Forester* as it was to ourselves.

The points of resemblance between the forests and their working in the United States and Canada are many, of course, and there are also important differences. The forests of the Douglas Fir and other species belonging to the *Coast Provinces and Interior Provinces of the Pacific Forest District* extend from the south through British Columbia and along the slopes of the Rockies in Alberta, nearly 800 miles northwards. In the east the area of the White Pine forests approximately coincides with that of the administrative Provinces of Quebec and Ontario. With the White Pine are also associated the Red Pine (*P. resinosa*) and the Jack Pine (*P. Banksiana* or *divaricata*); the latter has a much wider range northwards and north-westwards. As in the U.S., the prairies of the territories of the Middle West are almost treeless. Nearly all the northern half of the Dominion is included in the *Northern Forests of the Atlantic and Pacific Districts*, with their forests of slow-growing spruce, which reach as far north as the limit of tree growth. In spite of the enormous wheat tracts of the west and the large settlements of the older provinces it is said that 75 per cent. of the country is still under forest-growth. The principal species are almost entirely coniferous. Canada, according to its present boundaries, has the greatest wooded area of any country of the world. Not only so but owing to its geographical position, its climate and configuration, it is certain to be the greatest wood supplier in the future. At least if any other country can provide as much timber, none will be able to supply so much pulp wood, for although the spruce (*Picea nigra*, black spruce, and *P. canadensis*, white spruce) has been nearly exhausted in the Eastern Provinces in the more accessible areas (as has also been done in the corresponding part of the United States), the productive as well as unproductive areas of stunted growth in the north seem now almost inexhaustible.

*What is being done.*—In India we do not hear much about forestry from Canada, but on the spot the whole forest question looms large. For a large part of the present and future prosperity of the country is bound up with the welfare, the wise administration of the vast stretches of tree-growth, whether by the State or by private owners. And yet, as a whole, the Government, officially, is singularly apathetic. It is not that the instinct of the woodlands is not in the Canadians, and individual interest in the adoption of conservative methods among the officials and other classes is very considerable, but relatively very little has been *done*, and the organisation and staffs of forest workers for purposes of conservation are extremely small and utterly inadequate. And yet the necessity for such is just as great as it is in the United States.

True, in the latter the difficulty was, and still may be, to keep a sufficient area under forest to ensure a sufficient wood supply for home markets, while in Canada this could hardly occur, but the

duty of exercising a wise economy and of keeping timberlands under a fair standard of forest growth, whatever the latter may be, and of arranging the methods of harvesting and protection accordingly, is not less but more operative there. We cannot but say that we believe that the want of development of an organization and sound method of forest policy on a proper scale is due not only to the political influence exercised by the lumbering interest which was antagonistic to such in the past, but more to the failure of the highest authorities in the Dominion to appreciate the importance of the question and to their ignorance of the methods of forest economy. That this unsatisfactory state of things is also partly traceable to the lack of method which exists in the mother country admits of no doubt at all. If Canadians wish to conserve their forests, they must do it of their own accord.

This may seem a severe indictment, but it is not overdrawn. The heavy clouds of indifference have however lifted at one corner of the horizon, and the work that is being done by the small Governmental staffs, and also under the auspices of the Canadian Forestry Association, all of very recent origin, gives promise of better things in the future. But the amount of work which lies in front is enormous! A few remarks on exploration, land settlement, timber licenses, forest reserves, fires, plantations, will suffice to convey some idea of the present condition of affairs.

They are drawn from reports of the Superintendent of Forestry for the Dominion, i.e., all outside the older Provinces, and from those of the Canadian Forestry Association, and from information kindly supplied by the Director of Forestry for Ontario.

*Exploration and Land Settlement.*—The third of the "primary objects" of the Canadian Forestry Association as detailed in its constitution is stated to be "to consider and recommend the exploration, as far as practicable, of our public domain and its division into agricultural, timber and mineral lands, with a view of directing immigration and the pursuits of our pioneers into channels best suited to advance their interests and the public welfare. With this accomplished, a portion of the unappropriated lands of the country could be permanently reserved for the growth of timber." Of Canada only the areas near the settlements have been explored in a detailed manner. Hunters and trappers and seekers for mineral wealth have no doubt wandered over the whole of the Confederation more or less, and it is mainly on their reports that information about the forests of the north is obtained. Comparatively little is known about the country in the older Provinces north of the watershed (height of land) which divides the rivers flowing into Hudson Bay from the tributaries of the St. Lawrence, and again in the north-west Territories, of all the ground more than about 600 miles from the international boundary. Exploration has, indeed to a large extent, failed to precede settlement in the systematic manner which is essential to the welfare of the country.

It has thus come about that in many and important cases land which has been opened for settlement (in much the same way as is done in the United States) has proved really unsuitable for the purpose, and again pseudo-settlers have applied for and obtained lands to settle, whether for themselves or as agents for others, merely for the sake of cutting out timber. In both cases, as also in the case of genuine settlers, forest fires are a common accompaniment, for the easiest way of getting rid of rubbish, which may include timber in this case, is to burn it. In any case the question is a thorny one, for it is difficult always to reconcile the interests of the often ignorant settlers on one side and of the lumbermen and the Government as owners of crown timber lands on the other, but with a better organised and more extended system of exploration, both the settlers and the country as a whole would be less liable to loss. The complaints from some lumbermen of loss to themselves from immature settlements are very loud. Exploration too is essential on behalf of the general community in order that a better estimate may be formed of the timber wealth of Canada with a view to future exploitation, for there appears to be no doubt that fire has passed over considerable areas of what has been assumed to be virgin forest with a large stand, leaving its commercial value a fraction of what it should be. The Government should be in a position to judge of the possible prospective value of undeveloped areas. The result of want of foresight in the past is that lumbermen are taking an unfair and probably increasing proportion of the profits on the timber of licensed lands, a part of which should be flowing into the public treasury.

*Timber-licenses.*—Many of the wealthiest men in Canada are lumbermen, and this will always continue to be the case. In the east they are coming into line in more conservative treatment of the forests. In the United States the lumber companies buy the land together with the timber on it. In Canada the land remains in the ownership of the State, but although in name the latter is by so much the better off, in reality the advantage does not seem to be very great. The practice in the province of Ontario is typical, and is as follows\*: Formerly concessionists were allowed to cut timber on crown domains free of any charge. Afterwards "a system of timber dues was adopted and licenses were issued from year to year authorizing the cutting of timber within specified limits subject to the payment of the prescribed rates . . . another step in the development of the system was the gradual introduction of the plan of disposing of timber-licenses at public auction . . . the conditions of the timber-licenses were drawn so as to leave the Government free to withdraw from the territory included such land as might be required for settlement and allow homesteads to be located. In a large part of older Ontario the lumberman

\* From a paper read by the Director of Forestry, Ontario, before the C. F. A., in March 1902.

thus became the pioneer of settlement and civilization, and in every locality where the character of the soil gave promise of successful agriculture the removal of the more valuable timber was followed by the opening up and cultivation of the land." The license-holders in Ontario now pay 3 dollars per square mile land tax and 1 or 1.25 dollars per thousand board feet of stumpage, together with the amount bid in auction to secure the monopoly. The timber-licenses are issued for one year only, but although this is so, "it has been the regular practice to renew them as a matter of course from year to year so long as the conditions were complied with and the annual ground rent paid, excepting only in cases where the land was needed for agricultural settlement. *Relying on the good faith of the Government*, licenses have been transferred from one holder to another, the same as bank stocks, without fear that the Government might exercise its undoubted legal right of cancelling the license at the end of the year." A case occurred in 1902 in which the license-holder transferred a license covering 129 square miles in Ontario to a well-known lumberman for 655,000 dollars, this large sum representing simply the right to cut or the accumulated 50 cents to 3 dollars per mile land tax paid by the limit-holder yearly for a number of years. True, the area had not been worked much for a considerable period, and the price partly represents the difference between 6 dollars, the value of the stumpage per thousand board feet, and 1 dollar, the Government dues on the latter. Undoubtedly a re-adjustment is necessary, and will be made in these areas of older development which will be fair to both parties. "In the sales of the last two years the term beyond which licenses will not be renewed has been fixed at ten years." In New Brunswick, to ensure a certain fixity of tenure to the limit-holders, enough to give them an interest in the well-being of their limits, the term is now 25 years, a long period. Thus in the older portions of the Provinces the limit-holders have a kind of vested right in the timber though not in the land. It is to be hoped that, in dealing with undeveloped areas, measures will be adopted to ensure a larger proportion of the profits coming to the State. Be this as it may, the interest which is being shown by lumbermen in the advantages of conservative lumbering, in fire protection, and again as members of the four-year old Canadian Forest Association is a hopeful sign for the welfare of the forests in the future. If State aid is required anywhere, it is required here in fostering this spirit and in giving aid and information.

*General Forest Administration.*—Next as to the formation of reserves. Before explaining how far this has progressed, a few words about the special forest administration and forest staffs will be useful. The five older Provinces, Quebec, Ontario, New Brunswick, Nova Scotia and Prince Edward Island, have each their own Local Government. The writer cannot say what special staff there is in the case of the first and of the last three;



but in each there is doubtless an adequate staff for the allotment and disposal of timber lands, for the control of the extraction of timber, and the collection of timber dues. In Ontario the office of Clerk of Forestry to the Government was created in 1883. "For some time after the creation of the office, the Clerk devoted his attention to educating the public as to the danger of deforestation owing to the over-clearing of farms and lands in the possession of private individuals. In 1895 the office was transferred to that of Crown Lands ..... " and is under the Commissioner of the same..... and the Director of Forestry is now, at least, also the Director of Colonization. Since that time its work has been mainly directed towards the forestry problem in connection with the lands of the Crown rather than the reforestation of farm lands." The combination of the two offices of forestry and colonization struck us as, curious, but, given an adequate staff and sympathetic treatment the natural antagonisms disappear, and there is much to be said in its favour.

**Reservations.**—At any rate the Ontario Government has adopted a more progressive policy than that of the other provinces, and in 1893, by a Special Act, withdrew from settlement nearly 2,000 square miles of land unsuited to cultivation to form the Algonquin National Park. A Forest Reserves Act was passed in 1898, and since then three reserves of 126, 70, and 2,200 (Temagami) square miles have been made. A commencement has been made in the "creation of a large permanent forest on the watershed between the St. Lawrence and the rivers running into Hudson Bay. An estimate is given that the Crown forest of Ontario will ultimately comprise fully 40,000 square miles."

No reserves appear to have been formed in the remaining older provinces, but in Manitoba, British Columbia, Alberta, and Assiniboia some large tracts have been set aside. As at present constituted political administration of the first two is by a Lieutenant-Governor and Local Government, and the same is the case with the combined four territories of the Middle West, in which Alberta and Assiniboia are included. For Government forest work in these six, together with the five remote territories of the north, the post was created, four years ago, of Dominion Superintendent of Forestry. Forestry Branch of the Department of the Interior—this branch may be called on to operate over three-eighths of the whole Dominion of Canada! We shall hardly be wrong in saying that the size of the staff is in inverse proportion to the area of its charge.

In the four provinces or territories specially named above, the creation of reserves and national parks was commenced some few years ago. Up to two years ago eight or nine had been created in these areas of greater development, namely, four in and adjoining Manitoba aggregating over 2,000 square miles, and apparently forest land with little valuable standing timber, and four in Alberta and British Columbia in the Rocky Mountains, and westwards to

the Pacific; of these latter the reserves on the main range of the Rockies aggregate roughly between 5,000 and 10,000 square miles (the areas are not clear in the reports), and there is besides a railway belt 500 miles long and 40 miles wide along the Canadian Pacific west of the main range, with valuable timber along 350 miles of its length.

Thus the total area of forest reserves and parks in the Dominion aggregates something between 20,000 and 30,000 square miles. These figures, if only approximate, are a valuable indication and avowal of a policy of State forestry. As in the U. S., no work is yet done in the Canadian reserves, but they are protected, especially from fires.

*Fires.*—All the reports contain an amount of information about forest fires and the preventive measures adopted. Canada has gone ahead of the United States here. A great deal has been and is being done, but much remains to do in the more settled parts of the Dominion. The great difficulty seems to us to lie in giving protection to the more undeveloped and remote areas which may be expected to be exploited for timber or settled within a period which is but a fraction of the life of the forest. It is in these that disastrous fires ravage unchecked; while in the former very large conflagrations are now uncommon. Fire prevention Acts have been enacted in all parts of the Dominion. In all the reserves fire-rangers, drawn from the neighbouring population, are kept on during the dry periods of the dangerous months, April to September, and their efforts have met with much success. In the instructions issued to them from the office of the Forestry Branch of the Dominion we find that the principal causes of fires are settlers, railway engines, camp-fires, hunters, prospectors and fishermen. The first has already been referred to; as to the second special clauses of the Fire Act pertain to the railways. Though fires constantly originate from the last two causes, control is more easy than would be supposed owing to the large number of lakes great and small in the country, with the consequence that, transport being largely by canoe, the lines of communication are limited and defined; also doubtless lakes and streams form effective fire-lines. Partly for this reason the fire staff is extremely small.

In Ontario too, at least, lumbermen are compelled to protect their own limits, and in all but a few cases would do so without compulsion; indeed they claim better results for their protection than are obtained by Government. In a report compiled for the C. F. A. on the fires of 1901, we find that the biggest fire (an exceptionally big one) in Ontario in the settled portion was one of 120 square miles on the borders of Quebec, and in the unsettled districts one estimated at 300 square miles. None of such magnitude are reported elsewhere, except one of unknown extent in British Columbia, and it would appear that very few single fires burn more than 5,000 acres. Still the value of timber destroyed in these coniferous forests is very large. The lumbermen etc., of

British Columbia are among the worst sinners ; the forests seemed so endless, timber per unit is worth less than in the east and the bad example of the far western States of the U. S. is near at hand.

That very considerable sums are already being spent on fire protection is evident from the fact that nearly 30,000 dollars were spent in 1901 by the Provincial Government of Ontario alone.

*Planting.*—Finally, mention should be made of the extensive co-operation of Government with the settlers in tree-planting round homesteads and farms in the treeless parts of the prairies of the Middle West. This work, begun in 1901, has assumed large dimensions, the number of applicants for trees for 1903 being 436. The trees supplied are of the indigenous species, maple, cottonwood, elm, willow, ash.

The main heads treated above in the consideration of forests and forestry in North America have been organization, and in some degree administration and protection. Sylvicultural questions are ever interesting, and the reproduction of principal species in the numerous zones of the Great North American forests opens a wide field for speculation and work. It is, however, outside the scope of the present paper with the exception of the few lines already given to it.

*Practical Exploitation.*—Exploitation is written large on the face of all accessible areas. As regards the practical work of exploitation, the writer enjoyed some exceptional facilities in visiting one of the lumber camps of the St. Paul and Tacoma Lumber Co., State of Washington, and seeing the method of extraction by means of donkey-engines (bull donkeys), and again in inspecting their saw mill, and also that of Messrs. Booth of Ottawa, two of the largest concerns in the lumber world. A short description has already been given of the forests of the first. They are situated some 30 to 60 miles from the mill at Tacoma, which stands on the Paget Sound, an arm of the Pacific. To supply the mill 75 to 85 truck loads of timber, averaging 6 logs apiece, mostly of Douglas fir, are sent in from the 7 lumber camps, and about 2,000 acres of forest are cut over clean each year. The logs now taken out are 24 to 48 feet long, and  $2\frac{1}{2}$  to 4 feet in diameter at the butt end. Exceptional orders have been met for pieces 130 and 160 feet long. The timber taken out to the Ottawa mill is, at an average, much smaller and less clean, and the wastage in the forest proportionately less ; this is due to the cheaper carriage by water to the mill, to the greater but poorer quality of the white pine timber now available, and to lower wages of the mill and forest workers. The capacity of the Ottawa mill is, we were told, one million board feet per day, or twice that of the Tacoma mill, itself an enormous concern, and Messrs. Booth's licenses cover 4,000 square miles.





**SMALL GAUGE RAILROAD AND MAIN DONKEY ENGINE.**



**LUMBERING NEAR TACOMA: A DONKEY ENGINE PULLING ITSELF ALONG A ROADWAY.**

*Cutting and Transport.*—In the Tacoma Co.'s forest, then, the exploitation, which is typical of many other concerns, is as follows: The railway which runs from the mill consists of two parts, the first with standard gauge, easier gradients and trucks of the ordinary type; the second, which may or may not be required, with narrow gauge, higher gradients (maximum 12 per cent), and small, specially powerful locomotives for dragging a chain of logs down along the slightly hollow wooden track laid between the lines. This conducts us to within a mile or less of the scene of actual cutting operations. To get the timber down from the slopes, narrow roadways or skidways are made into the forest, as shown in the photograph, consisting of three or four logs laid side by side longitudinally, or of short cross pieces which are let into the ground at intervals of 9 feet; these ways are not more than a quarter of a mile apart. A donkey, engine fixed on a strong sledge, is placed at the junction of the railway with the roadway, and after it has hauled the timber from the forest in the immediate vicinity (these yarding engines work with a radius of 200 yards or so) it advances along the roadway pulling itself the required distance with the help of the tree stumps, and if necessary up steep gradients, and a "main" engine is then placed in the first position. The "yarding donkeys" haul single logs from the forest to the road, the "main donkeys" along the road, and these latter may work with a wire rope of half to one mile in length, hauling a chain of logs. Generally speaking, if the distance become excessive an intermediate donkey engine is placed. We were informed that the donkey engines work from 20 per cent (on level ground) to 50 per cent quicker than horses, which in their turn superseded cattle in the haulage, and that the saving on horses is 40 per cent or so. The "donkeys" work in wet weather or fine, and thus keep the mill constantly supplied, an important point. On the other hand, they consume 250 stacked cubic feet of fuel a day and a corresponding amount of water. There is no lack of either here. Great use is made of pulley-blocks with short rope lengths fixed to tree-stumps both on the roadways and in the forest to guide the logs round awkward corners.

*Conversion.*—The main features of the two saw mills visited were very similar. The round and sawn timber is transported through the mill by a succession of endless chains and rollers. In the Tacoma Mill are four band-saws. The log to be sawn is rolled up laterally to the trolley, on to which it is clamped, by means of an arm or nigger working from below the floor surface, and the trolley is then run up to and back from the band-saw with great rapidity. The newest band-saws are toothed on both sides, and can be moved up or down, frame and all, according to the size of log and work to be done. After being dealt with by the band-saws the sawn timber is trimmed by circular saws. For trimming laterally a very clever piece of machinery was shown. Planks of various lengths pass up one by one laterally on three parallel slightly inclined endless chains to a dozen

circular saws suspended in frames, above them, the line through their axes being parallel to the plank; the saws are controlled by levers at some distance, handled by a workman, who lets fall two or more of the saws according to his judgment and the quality of the timber. The planks are not cut at any special angle to grain. Clear wood without knots is worth two or three times as much as knotty material. Many shingles are also cut by means of circular saws. Not the least interesting part of the Tacoma Mill is the drying kiln, for rapidly seasoning planks, small scantlings and small stuff; it is a long brick building with steam pipes. The timber passes through in seven days, after sawing, and the weight is reduced about two-thirds. This could only be used for soft woods.

*Cost of the journey.*—In conclusion, it may be of interest to state that the trip starting from the north of India took exactly four months and cost just over £ 250. Twenty days were spent in Japan at a cost of £1 a day, thanks to the excellent arrangements made for us. In the United States forty-two days' stay and travel cost £ 2-6-0 a day, and six days in Canada a little less. Forty-four days' sea voyage cost £ 75.

R. C. MILWARD.

## VI.—EXTRACTS, NOTES AND QUERIES.

### British Timber and its Uses.

Some time ago Mr. Elwes published a paper on "British Timber and its Uses," and this paper was the subject of discussion at the last meeting of the Surveyors Institution—an Institution which concerns itself with Surveying, Timber and Forestry.

We read that at the discussion Mr. W. V. K. Stenning, Chairman of the English Timber Section of the Timber Trade Federation, disapproved strongly of the proposal to start two schools of forestry in Great Britain. He "did not consider that schools of forestry were wanted. So far as he was aware, he thought that a school meant a place where something could be taught, and so far as English forestry was concerned in the south of England there was absolutely nothing to learn, and there were many gentlemen in that room (and he could speak of his own knowledge), and Mr. Geo. Marshall knew as much, and possibly more than he, of the different kinds of trees grown on various kinds of soils, and the different aspects on which it was desirable to plant trees."

Unfortunately we do not all know as much as Mr. Stenning, and as he seems to keep to himself what he does know, there may be some advantage after all in furthering a knowledge of forestry in Great Britain by starting forest schools. Personally we have

no doubt of their use and of the necessity for increasing the forest area in Great Britain. The weak point in the present movement seems to be that it presupposes the pecuniary advantage which will result to landowners from afforesting their waste areas. With home-grown timber at present practically unsaleable at remunerative prices we do not wonder at landowners being shy of putting money into forestry.

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### **Cosmic Desiccation.**

Prince Kropotkin recently read a paper before the Research Department of the Royal Geographical Society, in which he discussed the desiccation of Central Asia and of the Caspian steppes of the lower Volga, and of the whole of south-eastern Russia. The conclusion to which he came was that recent exploration in Central Asia had yielded a considerable body of evidence, all tending to prove that the whole of that wide region is now, and has been since the beginning of historic record, in a state of rapid desiccation. At the present time evaporation over the whole of Central Asia is very much in excess of the precipitation, and the consequence is that from year to year the limits of the deserts are extended, and that it is only in the close neighbourhood of mountains, which condense vapours on their summits, that life and agriculture are possible with the help of irrigation. Prince Kropotkin traced the progressive drying up of lake systems and of rivers, and came to the conclusion that the destruction of forests was an insufficient explanation to account for the phenomena. His own view was that the desiccation that was going on over the whole surface of Europe and Asia, but more especially over the northern and more elevated portions of those continents, had been continuous since the end of the glacial epoch. We are living in a geological epoch of desiccation, an epoch as characterised by desiccation as the glacial epoch was characterised by the accumulation from year to year of unevaporated and frozen precipitation. He suggested that this was a subject worthy of investigation by men of science, and also that such measures as experience dictated should be taken for combating, within the limits of the possible, the coming drought. Possibly one of these measures might be tree-planting on a large scale in the menaced regions and the sinking of artesian wells, which appear to have given good results in northern Africa.

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### **Forestry in Wales.**

This important branch of rural economy in Wales is in a sadly neglected state, and beyond all doubt calls for immediate legislation either by the Government direct or through our various County Councils in the Principality.



Such a state is mainly due to the management in bygone days and the day in which we live, and equally so to the ruthless extravagance of landowners who have spent their money in other ways than improving their estates, and as such has been continued for generations, our woods and what remains of our forests are in a most wretched condition. But it is the duty now of all true Welshmen who desire the commercial welfare of their country to include forestry as a national requirement, and to propagate its study and its furtherance with tongue and pen wherever the same is possible. Of course, we cannot expect much in this matter from those who live in large towns, their minds being almost fully occupied in their own individual branch of industry; in fact, if you speak to some in town and country alike about "forestry" they conclude at once that you are going to speak of a friendly society.

It was not many days ago that a traveller called upon the writer of this article offering an encyclopedia published by a well-known London firm, and on asking him whether there was anything in it about forestry, he replied, "Oh, yes; ever so many pages are devoted to friendly societies." After an explanation he discovered our meaning, and then told us that there were chapters in it by a German, a Frenchman, and an Englishman on the class of forestry we are now writing of. We wondered how it was that there was not a Scotchman, because Scotland has done, and is doing to her credit, great things for the betterment of woods, forests and foresters, and many of her sons are holding important appointments on some English and Welsh estates.

To better the present condition of woods and forests in this country it is essential for us to win over to our side all large landed proprietors, many of them being M.P.s., and if not members of Parliament, they certainly carry influence and power with those who are. It is necessary to lead those noblemen and gentlemen to see that it is to the nation's interest and welfare, as well as their own, to care for our arboriculture as it should be cared for.

The management of woodlands demands intelligence and proper training. We would not speak disparagingly of many of the men who are now at the head of the staff of woodmen; but, nevertheless, we will say this; that they themselves and the woods under their care would have fared better had they received a proper early training. We do not suppose for one moment that a forester should be a bachelor or doctor in science. but he should certainly know every branch of science which concerns his profession. He should study botany, vegetable physiology, chemistry and kindred sciences required by any man who is desirous to be a forester indeed.

We believe once the landowners and others are led into the light of this there will be a dawn of better times for our woods and those who labour in them, as evidently much of the money

spent abroad can be kept in our own land to the comfort and welfare of the inhabitants.

On the whole, forestry is beginning to demand a little more attention in Wales than has been accorded it in recent years. Large areas have been planted with larch and pine, and our County Councils have taken a step in the right direction.—*Timber Trades Journal*.

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### Anticide.

A correspondent asks for information concerning the wood-preserving composition known as "Anticide." We have no personal experience of the material, which is said to be a powerful insecticide, a preventive of wood rot, and a timber preservative.

The agents in India for its sale are Messrs. Winter Bros., 17 Wellesley Place, Calcutta, and we will be glad to hear from Forest Officers who have had opportunities of judging its merits as a wood-preserver.

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### British Forest Trees.

Professor G. S. Boulger, F. L. S., F. G. S., gave a lecture to the members of the Ealing Natural Science Society recently on "British Forest Trees." He treated as indigenous the oak, holly, hazel, hornbeam, birch, ash, hawthorn, alder, willow, aspen, spindle-tree, cornel, wych-elm, maple, apple, rowan, sloe, and yew. Dealing with the natural history and uses of each of these in succession, he remarked that, down to the beginning of the eighteenth century, oak was practically the only timber used in this country for building and domestic purposes, and it was then displaced in favour of the fir, by this country obtaining control of the Baltic trade. Of all our trees none has wood which is both equally tough and hard as that of the oak, and these qualities of toughness and hardness are apparent in the growth of the tree, which, with its straight stem and horizontal boughs, defies the laws of gravity. The durability of oak timber is shown by many well-preserved examples of ancient work, such as the roof of Westminster Hall, which is proved now not to be of Spanish chestnut, the piles from the Savoy Palace and from Old London Bridge, and a dug-out canoe from the pre-Roman village at Glastonbury. King Arthur's round table is a section of an oak eighteen feet in diameter, but its antiquity cannot be carried back beyond the reign of Henry VIII. A less known tree is the hornbeam, the toughest British wood, which flourishes on the cold clay of the home counties. Formerly it was used for yokes for oxen (whence its other popular name, the yoke-elm), and is still used for cog-wheels. As to the hazel, it is curious that John Evelyn, our first authority on forestry, derives his name from the old name of the tree "avelan." In the same way the names of the great botanists Linnæus and Lindley are derived from the linden. It is to be observed that the hazel is always used for the dowsing-rod, though any other wood serves

equally well. The birch can be used for very many purposes. Before the introduction of the fir and larch, it was the principal timber in Scotland, and it was then said that the Highlanders made everything of it. This holds good at the present day in Russia and Canada. The bark is more durable than the wood, and is used for roofs, canoes, mocassins, and vessels to hold liquids. Further, it is valuable for tanning, and imparts its peculiar claimed aroma to Russian leather. The lecturer claimed that some of our yews are the oldest of living trees, their antiquity being estimated at 2,000 years. They are older than Christianity, the churches having been built near them. No wood resists decay better than the yew, and it is a saying in the New Forest that a post of yew will outlast a post of iron; certainly a living yew will. Professor Boulger was disposed to treat the elm as a native tree, as trunks have been discovered in the deposits of pre-human times. He pointed out that, although the seeds do not ripen in this country that is practically true wherever the tree grows. He was more doubtful about the beech, of which the same evidence of antiquity does not appear. Still, it is a tree which flourishes here, and has the remarkable property of ousting all other trees except the holly. The beech shows us what an important matter forestry is, on account of the large industries which it creates. Through the beech woods of Buckinghamshire has arisen the chair-making industry of High Wycombe, which supplies both a home and a foreign trade. The manufacturers have to import wood for the best work simply because sufficient attention is not given in this country to forestry. The planting in England has been done almost entirely for the protection of game, and a hope is to be expressed that our landowners will see that it is an advantage both to themselves and the country to introduce the scientific methods of Germany.

## VII.—TIMBER AND PRODUCE TRADE.

**Churchill and Sim's Wood Circular.***4th May 1904.*

**EAST INDIA TEAK.**—The deliveries have been poor in April, say 550 loads, against 1,160 loads in April 1903. For the first four months of this year they are 3,334 loads as compared with 3,674 loads to the same date last year. Prices here are a point down in the absence of demand, but there is no change to report in the situation ahead.

**ROSEWOOD—EAST INDIA.**—If good and sizeable, finds ready buyers, but small or poor logs are not readily placed.

**SATINWOOD.**—East India —Stocks are heavy and the demand shows no improvement; business is still checked because buyer's and seller's ideas of value are too far apart.

**EBONY—EAST INDIA.**—No sales have been made, as there is no improvement in the demand.

**PRICE CURRENT.**

Indian teak, logs, per load ...	... £9-15s. to £18
„ „ planks, „ ...	... £12-15s. to £20
Rosewood, per ton ...	... £6 to £12
Satinwood per s. ft. ...	... 7d. to 18d.
Ebony per ton ...	... £5 to £10

**Denny, Mott and Dickson, Limited.****WOOD MARKET REPORT.***3rd May 1904.*

**TEAK.**—The landings in the docks in London during April consisted of 335 loads of logs and 249 loads of planks and scantlings, or a total of 584 loads as against 1,029 loads for the corresponding month of last year. The deliveries in to consumption were 150 loads of logs and 405 loads of planks and scantlings—together 555 loads—as against 1,126 loads for April 1903.

The Dock stocks at date analyse as follows:—

6,551 loads of logs, as against 5,062 loads at the same date last year	
3,852 „ planks „ 2,901 „ „ „	
— „ blocks „ — „ „ „	
<b>Total</b> 10,403 loads „ 7,963 loads „ „	

The above figures need little comment. The consumption continues to be very contracted, but practical proof is consistently given of the shippers having no desire to put more teak on the market than the consumption justifies. They are also exception-

ally cautious in making any large commitments for prompt shipment, from which it may be soundly inferred that the supplies at the shipping ports are so contracted that any expansion of the demand on this side would cause a heavy rise in price, whilst there is no room for a fall in value—even if the present poor demand continues for the rest of the year, which is perhaps an unduly pessimistic assumption.

The bright weather during April and the somewhat easier money conditions caused by the reduction of the Bank rate have combined to give a more cheerful feeling in the trade, and even induce some buying for forward delivery. The cautious hand-to-mouth policy, however, is still the dominating feature in business; and the easier money rates have not affected the great caution, which characterises those who hold the purse strings.

### Market Rates for Products.

*Tropical Agriculturist, May 2nd 1904.*

Cardamoms	...	... per lb.	1s. 6d. to 1s. 7d.
Croton seeds	...	... „ cwt.	20s. to 22s.
Cutch	...	... „ „	22s. 6d. to 30s.
Gum Arabic	...	... „ „	15s. to 20s.
„ Kino	...	... „ lb.	4d. to 6d.
India-rubber, Assam	...	... „ „	2s. 3d. to 3s. 7½d.
„ Burma	...	... „ „	2s. to 3s. 7d.
Myrabolans, Madras	...	... „ cwt.	5s. to 6s. nom.
„ Bombay	...	... „ „	4s. to 7s.
„ Jubbulpore	...	... „ „	4s. to 6s. 3d.
„ Bengal	...	... „ „	3s. 6d. to 5s. nom.
Nux Vomica, Cochin	...	... „ „	5s. 6d. to 10s. 6d.
„ Bengal	...	... „ „	6s. 6d. to 8s. 6d.
Oil, Lemon grass	...	... „ lb.	8d. to 8½d.
Orchella weed	...	... „ cwt.	10s. to 12s. 6d.
Seedlac	...	... „ „	170s. to 190s.
Tamarinds, Calcutta	...	... „ „	8s. to 10s.
„ Madras	...	... „ „	4s. 6d. to 6s.

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## **Pioneers of Indian Forestry.**

**CAPTAIN FORSYTH AND THE HIGHLANDS OF CENTRAL INDIA.**

BY E. P. STEBBING.

Last year Colonel Pearson gave us some most interesting recollections of the infancy of the service in the Central Provinces, and in doing so incidentally mentioned the selection and appointment as Assistant Conservator of Forests of a young Punjab Infantry Officer by name Lieutenant Forsyth, a remarkable and gifted man, who but for his untimely death at the early age of 33 would undoubtedly have inscribed his name as one of India's great Administrators. I propose in these articles to give some description of the man and his work, both well worthy to be kept ever green in the memory of his successors, and of the conditions of the country at the time he worked in it. My notes are chiefly gathered from his own 'Highlands of Central India,' which he did not live to see completely through the Press. No greater praise is required for this book than to say that it is well worthy of the man and that it should find a place on the shelves of every Forest Officer, of every sportsman and lover of nature, serving in India. Would that more such were in existence. Modesty is a good trait, but, like many other good things, pushed to extremes verges on that border line (or crosses over it!) which separates it from foolishness on the one hand and laziness on the other.

Captain Forsyth was born in the year 1838. He entered the Bengal Staff Corps, serving through the Mutiny. He was appointed to the newly-raised 25th Punjabis in 1857, and served with them till the beginning of 1862, when he joined the newly-constituted Forest Service as Assistant Conservator, and commenced work in the Pachmari Hills early in January of that year. His reasons for quitting Military employ sum up the character of the man.

"On the 11th January I bade adieu to the pretty little station of Jubbulpore (now fast becoming a large and important Military cantonment), and to my comrades of the gallant 25th Punjabis. I was really sorry to see the last of the jovial, manly company of Sikhs who composed the Regiment, one of the first

of the force that rose on the ruins of the Bengal Army in 1857. But soldiering in India, in time of peace, is truly one of the dreariest occupations; and I confess I was far from doleful at the prospect of quitting the bondage of parade routine for the free life of the forest; and to think that

“No barbarous drums shall be my wakening rude;

The jungle cock shall crow my sweet reveillé.”

As the name of Forsyth's book implies, the country in which he served was a hilly—in other countries remote from the shadow of the mighty Himalayas one would say a mountainous—one, situated in what are now known as the Central Provinces. For the benefit of those unacquainted with the configuration of this portion of the continent a short description of the area and its inhabitants will perhaps be not out of place.

In the region to which the term “Highlands” is applicable several of the great rivers of India have their first sources and pour their waters into the sea on either side of the Peninsula—to the north the Son commingling with the Ganges, to the east the Mahanadi, flowing independently to the Bay of Bengal, to the south some of the principal feeders of the Godavari, and to the west the Nerbada and the Tapti, taking parallel courses to the Arabian Gulf. If the head waters of these rivers are sought out on a map, the reader will become acquainted with the region in which Forsyth's work was carried out. It forms the central and culminating section of a ridge of elevated country which stretches across the Peninsula from near Calcutta to near Bombay, and separates Northern India or Hindostan proper from the Deccan, or country of the south. The general level of what may be called the plains of this area here gradually reaches an altitude of about 1,000 feet above sea level. Ranges of hills, at first fairly low but in places attaining a height of 1,000 feet, rise from the ‘plains,’ and beyond these peaks and plateaux present themselves evidently much higher. Valleys are everywhere found penetrating the hills, by following which one rises to these higher regions in which the cultivation below changes to forest-covered land or waste scrub.

In this region all is chaos to the unguided traveller; hill after hill of the same wild, undefined character are piled together, the streams appear to run in all directions at once, and to understand the geography becomes a difficult matter. A study will show that at about 1,000 feet above the level of the ‘plains’ (or 2,000 above sea level) the hills have a tendency to spread out in the form of plateaux; some comprising the top of only one hill and a small area; others like a group of many hills, which support, like buttresses, on their summits large level or undulating plains. From these again it will be seen that a good many flat-topped hills rise up, reaching the height of nearly 3,500 feet, some of which in like manner unite into plateaux at about the same elevation. Yet higher than these but never assuming the character of a

plateau here and there a peak may be seen rising to nearly 5,000 feet above the sea. To the Range in which Forsyth's work was done geographers have applied the name Satpura. The Hindus of the plains have, however, several names for different sections, terming the most easterly the Mykal, the centre the Mahadeo, and the western the Satpura hills. From its western extremity in the fork of the Bhusawal-Jubbulpore and Bhusawal-Nagpur Railway lines the mountainous region extends eastwards for a distance of about 450 miles with an average breadth of 80 miles.

There is little historical record of what took place in this extensive tract prior to about the middle of the 16th century. The country was called Gondwana and was inhabited by a people termed the Gonds. It is probable that during the 14th and 15th centuries a great immigration of the Rajput clans took place into the country of the aborigines, the Rajputs recoiling from the Mahomedan invaders of Upper India who were then pressing into the country between the Ganges and Narbada rivers which the former occupied. The Rajputs apparently intermarried with the indigenous tribes to a certain extent, the chiefs, however, keeping their descent pure and ruling over the intermixed races. With the establishment early in the 17th century of a strong Mahomedan Government under the Great Akbar, the impetus given to the development and civilization of the dark regions of India by the wise rule of that great administration led to the immigration and settlement of large colonies of the industrious agricultural races who had already reclaimed the soil of Northern and Western India. The Gonds retired to the higher plateaux and slopes of the Central hills, where their hunting instincts and rude system of raising coarse grains on which they existed could still find scope. The more extensive plateaux were also soon invaded by the aggressive race and their level black soils covered with crops of wheat and cotton, the surrounding belts of rugged unculturable country remaining in the hands of the aborigines. Thus ere long the tribes were not only surrounded but interpenetrated by large bodies of Hindus. When the Maratha power began to supplant that of the Moghuls in the latter part of the 18th century, the hordes from the Deccan began to overrun the country of the Gonds, but the conquest assumed little of a practical character in the interior of the hills, the mountaineers continuing to wage a desultory war against them from their fastnesses. At the beginning of last century the Gonds and Bhils were little better than hill robbers, the exactions of their oppressors having reft from them the last of their possessions in the plains. It was at this period, if not before, that every pass in the hills was crowned by the fortified posts of the hill men, the ruins of which are so common throughout this area at the present day, picturesquely overgrown with the thick tangle of an Indian jungle growth, the lair of many a forest denizen. In the year 1818 this state of things was put



an end to by our final success over the Marathas and the extermination of the plundering bands. But the new territories which we acquired had been almost desolated by a quarter of a century of utter absence of government, whilst the hill people were frenzied by the excitement of a life of plunder. The Saugor and Nerbada territories, as the northern half of the country was then called, were acquired by us in full sovereignty after this war. The southern portion remained nominally the territory of the feudatory Raja of Nagpur, but had long been under British Administration when, in 1854, it too was annexed on failure of heirs. The Gavilgarh hills in the extreme south-west formed part of the Nizam's territory of Berar; but that also has been for many years under British management. With the establishment of a strong Government the hill men soon became a submissive and law-abiding people. They were, however, left pretty much to themselves and little exploration of their hills had been undertaken during pre-mutiny days. Along with many more important provinces, however, this secluded region felt the benefits of the impulse the Mutiny gave to the administration of the Empire. The iron road was to be driven through the heart of its valleys, and Manchester began to look at its black soil with an eye to cotton. In 1861 the province known as the Central Provinces was constituted under the Chief Commissionership of the late Sir Richard Temple. Under this energetic and tireless man things very soon altered for the better in this neglected area. This Chief was not long in perceiving that the highland centre of the province, with its extensive forests and mineral wealth, its limitless tracts of unreclaimed waste and scanty half-wild population, and its great capabilities for the storage of precious water was worthy of a principal share of attention. It had already been whispered by a few that its forests, calculated on by the projectors of the railway lines, then being constructed through the province, for their supply of timber, were likely to prove a broken reed, having been already exhausted by a long course of mismanagement; and one of the first steps taken was the organisation of a Forest Department, for the detailed examination and conservation of the timber-bearing tracts. An Officer, Captain (now Col.) G. F. Pearson, so well known to us all, who had already interested himself in the question, and had travelled extensively in these regions, and who was admirably fitted for the task by physical qualities, and the possession of that faculty of observation which is not to be acquired either in competitive examinations, in the study, or on the office stool, but which is an absolute *sine qua non* in the Forest Officer, was selected as the Superintendent of the new Department. A better choice could not have been made. During the next five years several officers, of whom Forsyth was one, were unremittingly employed in the exploration of the 36,000 square miles, which may be taken to be the area of the Central hills, besides doing much to examine an

almost equally extensive tract of low-lying forest in the south of the province. It was soon found that the claims to ownership of both cultivated and waste lands were in a state of utter confusion. The courts became congested with disputes as to the former, whilst culturable wastes became more and more in demand as settlers pressed into the country—a demand which the shortly-expected opening of the railway promised to largely increase. The forest questions also became urgent, timber being required in large quantities by the railways, whilst a fear arose of the impending exhaustion of the forests of the country. Nothing could be effected in the latter direction until the question of title in these wastes had been determined. To effect this Government appointed special Settlement Officers in every district in the province and ten years' hard work enabled the matter to be set at rest. The grand result as affecting rights and interests in the land was that where any title that could be converted into a right of property was established, the freehold, bearing liability to the fixed Government rent-charge, was bestowed on the claimant; while all land to which no such private title could be established was declared to be the unhampered property of the State. Most of the hill chiefs were admitted to the full ownership of the whole of their enormous wastes, though certain restrictions as to the destruction of the forests were here (as in all civilised countries except Great Britain) imposed on the proprietors. Under this settlement (in which Forsyth served as Settlement Officer of Nimar for three years, drawing up a report which was said to be second only to that of Sir Charles Elliott) about 14,500 square miles only in the Highlands remained to the State, of which 9,500 were considered culturable and the rest barren waste. A portion of this area was reserved from disposal to private persons as State forest, but in every district there was much good land available for sale or lease.

The total population of the tracts we are considering was in Forsyth's time about  $4\frac{1}{2}$  millions, of whom about  $3\frac{1}{2}$  millions were Aryans and one million only aboriginals, of whom the great majority (826,484) were Gonds, they being distributed in greater or less density over the whole of the hilly portion of the tract. In the extreme north-east were about 37,000 of the tribe known in Chota Nagpur as Kols, a race closely allied to the Santals. In the very centre of the Highlands on the higher plateaux of Pachmari and Gavilgarh, surrounded and isolated by the Gonds, were another race called Kurs or Korkus, numbering about 44,000, whose language and general type are almost identical with the Kols and Santals. All these Kolarian tribes differ radically in language from the Dravidian Gonds. Further to the east again in the Mykal Range, embedded amongst the Gonds, were a small body of about 18,000 Bygas, mere hunting savages, who had entirely lost all trace of their own language and spoke a rude dialect of the tongue of the Aryan immigrants. They present some

points of affinity to the Bhils of Western India, of whom also in the extreme west some 20,000 were reckoned in this mixture of tribes. The number of the aborigines was made up by some 25,000 souls, the fag-end of tribes with neither language nor country of their own.

As the region thus forms a mustering place of many races of man, so is it also remarkable as forming a place of junction of several forms of vegetable and animal life which seem to be characteristic of North-Eastern and South-Western India.

Perhaps the principal forest tree of Upper India may be said to be the sal (*Shorea robusta*), a tree whose habit it is to occupy the whole of the area on which it grows to the exclusion, more or less, of all other species. It forms vast forests in the Lower Himalaya, and covers also the greater portion of the hilly region to the south of the Gangetic Valley. From the latter tract it stretches along the tableland of Chota Nagpur, thence extending into the Central Provinces in two great branches, separated by the open cleared plain of Chattisgarh. The southern branch reaches as far as the Godavari River, and the northern embraces the eastern half of the highlands I have described, both branches ceasing almost exactly at the eightieth parallel of east longitude. To the west of this the teak tree (*Tectona grandis*) comes in. This tree is absent in Northern India and Bengal and is found but sparingly in the Central Provinces to the east of 80° longitude. It is not so exclusive in its habit of growth as the sal, appearing rather in the form of scattered clumps among other species than as the sole occupant of large tracts. Of the two the sal was undoubtedly best adapted to survive under the peculiar conditions to which both were exposed before the advent of a protective Forest Department, owing to its remarkable powers of propagation, the tree shedding an enormous number of seeds at the commencement of the rains, after the usual jungle fires which annually swept over the forest tracts, which germinated immediately on reaching the ground. The teak, on the other hand, seeding after the rains, was not in this advantageous position, since the seeds, covered by a hard shell which requires long exposure to moisture and heat before germination can take place, were exposed to the dangers of a fire season before they could sprout. The geological formation appeared also to be a great determining factor in the species of tree present in the forests at the time of Forsyth's inspection of them. It was noted that the sal shunned the trap formations, it being unknown within the great trappean area to the west of the 80° of longitude; whilst even to the east of that line in its own peculiar region it did not grow where isolated areas of the trap rocks were found. On the other hand examination showed that though the teak did not appear to shun any geological formation it thrived best on the trap soils which predominated in the south and west of the province. Forsyth's conclusions were that the sal exterminated the teak wherever it met with it on soils favourable to both.

Instances are numerous in the tract with which we are dealing. Occasionally isolated patches of sal are found, perhaps surrounded on three sides by teak, the fourth being open cultivated country with sal forest beyond. An examination of the geological formation on this fourth side showed that it is not trap and was, previous to the advent of the cultivator, in all probability occupied by a continuous strip of sal forest. In this manner Forsyth was, able to explain the at first unaccountable distribution of the two trees and accumulate some sylvicultural notes of infinite value to his successors. This peculiar distribution in two of the chief forest species of the flora of the area would seem to be also followed by a corresponding distribution in the fauna of this region. Equally with the sal tree several prominent members of the Central Indian fauna belong peculiarly to the north-eastern parts of India. These are the wild buffalo (*Bubalus arni*), the twelve-tined 'swamp deer' (*Rucervus Duvancellii*) and the red jungle fowl (*Gallus ferrugineus*). All these were plentiful within the area of this great sal belt in Forsyth's time, but did not occur to the west of it except in an isolated inaccessible sal patch in the Denwa Valley, when the two latter again recurred. In so small a patch the buffalo would have quickly been exterminated by the inhabitants of the neighbouring cultivated land.

Two other large representatives of the eastern and western faunas, the wild elephant and the Asiatic lion, also appear to have extended far into this region. In modern times however the advance of cultivation and persecutions of the hunter have driven them both almost out of the country here dealt with. The former in the time of Akbar (*vide* Abul Fuzl's 'Chronicles') ranged as far west as Azirgarh, but is now confined to the extreme east of the province and on into the sal covered hills of Chota Nagpur. Sir Thomas Roe, ambassador from James I to the Court of the Great Mogul in the 17th century, speaks of the lion as being then common in the Narbada Valley. It is not now heard of to the east of Rajputana. Forsyth states that a lion was killed in the Saugor district in 1851 and another in the sixties a few miles from the Jubbulpore-Allahabad Railway. The hog-deer (*Axis porcinus*), so common in the sal tracts of Northern India, Forsyth never met with in the west of the province, nor did he find it numerously in the east. The black partridge (*Francolinus vulgaris*) of Northern India is replaced here by the painted (*F. pictus*), a closely allied species, and the great imperial pigeon of Southern India does not apparently cross the Narbada to the north, though not uncommon in the higher forests to the south of that river. These few short remarks on the distribution of the fauna could be easily lengthened, and it would be of the very greatest interest, both from a sportsman's and a scientific point of view, if some of the famous shikaries contained within the ranks of the service would publish in the pages of the *Indian Forester* any lists of the local faunas they will doubtless have prepared on their

trips for their own personal use and reference. I may here supplement Forsyth's notes on this subject by a remark on the Insect fauna of these two types of forest. Species have been found in the northern sal areas with identical or closely allied forms present in the Central Provinces, Chota Nagpur, Western Bengal and North-East Madras sal tracts, whilst species identical or closely allied present in the Central Province teak country reappear in Madras and even in Burma teak areas.

*(To be continued.)*

### **Deboisement and Decadence.\***

#### **I.**

In the beginning, deboisement (the clearing of forest) was a work of civilisation, for the forest had to be destroyed before the earth could be cultivated. The axe being too troublesome an engine of destruction, fire was employed, or the trees were killed by girdling (N. America). In place of the ancient shades appeared the yellow harvest, agriculture took the place of hunting, and the latter means of existence is now only practised by a few nomad races.

Primarily, then, civilisation required the destruction of the forests, but this destruction, now pushed to excess, has become a menace to the existence of civilisation itself.

Indeed, the tree plays an important part in the meteorology of a country. It allows the rains to filter through and restores them slowly to the brooks and to the air. Its leaves and roots are alike obstacles to rapid drainage. The annual mean of atmospheric humidity is about 3·5 per cent more in the forests than in the open country. The denser the foliage the better is the humidity preserved. On the other hand, the pines and the Australian eucalyptus forests serve to diminish excessive moisture in the soil.

The tree not only preserves water, it attracts it. Consequently the rains are more regular, more frequent, and less torrential. Under the shade the soil remains damp during the heat of summer. In Wurtemberg the difference between the temperature of the soil inside and outside forests may be as much as 8° C. Consequently a wind coming from outside is cooled as soon as it reaches the forest, its humidity is concentrated, dew is formed.

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\* By Dr. F. Régault in "La Revue" of 1st March 1904, a subject which has always possessed great interest for me, and one that is of the utmost importance.—F. GLEADOW.

For the same reason a cloud passing above a forest lets fall its moisture where it refuses to do so over the open country which reflects the hot rays of the sun.\*

The fact has been often observed. A field situated in the open may often be parched while it may be raining for the greater part of the year in the forest. In Malta, since the trees were destroyed for the culture of cotton, there may be no rain for three years together. On the other hand, in St. Helena, reboisement has caused the rainfall to become double what it was in the time of Napoleon. Even in Egypt, recent plantations have induced a rainfall hitherto unknown.

When the debodisement affects only the plains, the harm is not so great. The rivers still flow down from the mountains, and the thirsty valleys can still be watered by means of canals. Thus the Po and the Ganges, which provide for millions of people, descend from wooded mountain masses. Doubtless the climate becomes more variable: the orange trees have disappeared from Languedoc and from Provence where they grew formerly. But on the whole the crops continue to be abundant, thanks to the waters descending from the mountains.

But when the plain is of clay, where the drainage is difficult, the effects of deforestation are felt. The water, no longer sucked up by the trees, lies in stagnant swamps. When the people are also careless and neglectful of their canals and drains, the fever appears, and the population diminishes; for instance the Pontine marshes, the Dombes and Sologne in France. The Dombes began to get swampy in the fifteenth century. Great churches, easily able to hold the whole existing population, bear witness to the former crowding; in like manner the Sologne was formerly wooded and prosperous.

On the other hand, a marshy country is rendered healthy by reboisement. The replanting of the Roman campagna, of the Tuscan marshes, and of the Landes, have destroyed or reduced the former insalubrity of those localities.

When the mountains are bared, all is ruined. The rains are perhaps not much less frequent, but they fall torrentially and flow rapidly off the denuded soil. They carry off first the vegetable soil. The mountain shows its rocky skeleton, the rocks break up, cones of erosion are formed, landslides, gullies, unstable slopes, become so many running sores by which the substance of the mountain is carried down. The rocks offer more or less resistance according to their nature, but none remain firm. Granite splits up into enormous blocks which roll irresistibly down into the valleys. Limestones stand better, but ultimately break up, splitting along numerous parallel lines

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\* Numerous works have appeared on this subject. Among these may be quoted as classics Ebermeyer: *Die physikalischen Einwirkungen des Waldes aufu Lfteund Boden*, 1873; and G. Roscher: *Traité d'économie rurale et forestiere*, French translation by Vogel, Paris 1888, octavo.

under the action of the water reaching the inside and the sun heating the outside. It breaks first into great blocks which give the mountains the appearance of great cyclopean structures. Later the blocks disintegrate into small stones that go rolling down the slopes into the plain.

If nature were left alone at this stage she would soon bring back the vegetation. But the mountaineer is there with his sheep and goats; these animals are his only wealth; they finish the work of destruction by tearing out the grass instead of cutting it short, by browsing the young shoots, and by so cutting up the soil with their hoofs that it is easily washed down by rain.

When the highlands are ruined, what becomes of the plain? When the country is exposed to marine currents, it continues to receive rain. Thus the Gulf stream brings moisture to those European countries facing the ocean. But in the contrary case the country suffers from drought.

The river becomes a torrent when it rains, carrying down earth, trees and rocks. Swollen beyond measure, it rises over the plain in a sudden flood, which destroys houses, flocks, villages and people. Plains which receive the waters of wooded mountains are not exempt from floods, but these are slower and their effects very different, for they deposit a layer of fertile slime and may be very useful, like the Nile floods; even the Garonne, when it rises slowly, is a benefactor. The sudden flood is characteristic of denuded countries; it sweeps away the soil, and leaves behind a sea of stones instead.

Now the sky is always blue; the clouds no longer melt on the mountain; the latter can no longer supply the valley with water, for all the water rushed down at once. Now is the time of drought and famine. Irrigation is impossible, for the rivers are dry; one can walk along their stony beds until the next heavy rain brings down another flood. A given river formerly navigable cannot now fill an irrigation canal. The thirsty riverains shoot each other to obtain the water.

The cultivators try to continue the struggle by means of reservoirs and costly dams. The Romans knew this period when they had denuded Africa.\* But dams are dangerous, for they often burst. Soon even this resource becomes impossible, and the destruction of the plain follows that of the mountain.

## II.

These facts are known of many and have been often quoted. Democritus, Theophrastus, and Seneca mentioned them. Columbus, Leonardo de Vinci, Bernard de Palissy drew attention to them. "I marvel," said the latter, "at the great ignorance of men, who seem now so anxious to break down, cut up, and tear in pieces the beautiful forests that their predecessors had so preciously kept.

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\* Dr. Trolard : *La Colonisation et la question forestiere*. Algiers, 1891.

I cannot sufficiently detest the thing, and I cannot call it fault, but a curse and a misfortune for all France, because when all the woods shall be cut all the arts must cease."

Later, Buffon wrote eloquently on the subject. Bernardin de St. Pierre wept over Mauritius, which in losing its forests has lost its brooks. In our time the authors are numerous, Valori, Carrière, Bandrillart, Cluvé, Eliséé Reclus, Jeannell, &c.; but they are no more hearkened to than Seneca or Leonardo de Vinci; the denudation continues as before.

Great nations have died through not respecting their forests. The careers of Israel, of Assyria, of Greece, of Carthage, and of Rome are ended, but wars alone could not have brought the end. The most frightful disasters fail to destroy peoples. The germ of death was in them. When the crops refuse to grow, when the fields become deserts, then only the people disappear and the nation dies out.

Moses said of Palestine "that it was a country of springs, of brooks, and of lakes, a land of corn, of barley, of vines, and of figs, where man had but to garner in the provisions to satisfy his wants" In the days of Israel's prosperity, crowded multitudes were living on this corner of land. When David numbered the people he found in Israel 1,100,000 adult males, and in Juda 470,000, without counting women and children; Levi and Benjamin were not counted.

Where is now this green land of Palestine and its valiant people? "Mountains without shade, valleys without water, earth without verdure" says Lamartine of the environs of Jerusalem. The trees have disappeared and the people with them.

Let us cross to Arabia. There was a time when she was called Felix, "the Happy," and was full of people. In the inscriptions the Assyriologist may still read descriptions of flourishing nations, "Kindana and Subi, on the right bank of the Euphrates." The map shows now only deserts where the nomad plants his scattered tents.\* Assurbanipal conquered vast cities in Nejd and in the Hedjaz; they are swallowed in the desert. Mariab and Sabota have left gigantic ruins in Yemen. The nomad who camps there will not believe that such edifices were made by human hands. The trees and the towns are gone together.

Nothing astonishes the traveller more than these fragments of immense capital cities found in countries where there exist now neither water nor vegetation. Such instances are numerous; they are found in Turkistan, in Algiers, Tunis, Persia, Pera, &c., as Boppe says, "the denudation must be attributed to man."† In fact, before any region can be reduced to such a condition that it no longer supports a single one of the numerous forest

\*Lenormant: *Histoire ancienne*, t. VI., p. 425.

†Boppe: *Traité de Syticulture*, Paris, 1888. Introduction p. VIII.



species, it must first have become liable to the absence of rain, to incessant torrid heat, and to dry winds blowing with untempered force.

### III.

Proof can be obtained by the inverse, or synthetic method. In certain countries it is possible to replant, and by replanting to restore the ancient prosperity. Thus the Americans have transformed the canyons of Colorado and Nebraska, in ancient times inhabited by a numerous population, but later dried up and ruined by the clearance of the forest. These are now an immense orchard.

The French are engaged on a similar task in the plain of Sfax. They are reforming the ancient olive forests. The Arabs, when they destroyed the trees, destroyed thereby the cities whose enormous remains are still to be seen. Thysdrus with its circus and great temple was a town of more than 100,000 inhabitants; Suffleta contained 20 to 25,000, Cilium 12 to 15,000, Thelepta 50 to 60,000, and great burghs like Bararus, Maseliana, Meneger, Menogesein, Monianium, each had several thousand inhabitants. Between these towns and burghs the remains of villages and isolated farms are disclosed at every step.

When the trees are cut down, man is not the only thing that disappears; the fauna undergoes a corresponding change. It is astonishing to learn that in the neighbourhood of Niniveh there were thick forests in which Thothmes III was hunting elephants 1,700 years before Christ. In Algeria blocks have been discovered bearing Libyan writing, and pictures of the elephant, the giraffe, and the two-horned rhinoceros. The Carthaginians utilised the elephants. Hanno saw them at Cape Spartel, Herodotus saw them to the west of the Lesser Syrtis, Elian saw them between the Atlas and Getulia. Solin mentions them as late as the third century A. D. To-day no elephant could find a living in these regions.

Let us hasten to say that the destruction of forests is not the sole cause of decadence. In certain countries like Babylon, account must be taken of the carelessness of the inhabitants who did not maintain the system of canals. The Euphrates still carries water capable of ensuring rich harvests if the Turks took the trouble to clear canals.

Greek and Roman history provide us with examples of depopulation on which Montesquien\* and others have laid stress, but without realising that the real and fundamental cause was debouement. Formerly most prosperous and brilliant, Greece is now poor and sparsely inhabited. Formerly she had forests and rivers. Taking Schliemann as our guide to the plain of Argos, we see that it is dominated by Mount Eubœa, whose very name indicates bountiful pastures; to-day it is absolutely bare. Two streams, the Elentherion and the Asterion, watered the plain

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\* Montesquien : *Esprideslois*, Book 21, ch. 22.

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one supplied the sacred water for the temple, the other watered plants of the same names sacred to Hera. To-day both are dry, except in time of heavy rain. The plain of Argos was celebrated for its horses; in the "Iliad" no less than seven times does Homer praise its magnificent pastures, calling them "ippobotos." The ground is now so dry that even vines and cotton will only grow in the lowest and most fertile parts.\* In Greece, names derived from trees are extremely numerous; Carya is the town of walnuts, Valanidia that of certain oaks, Kyparissi that of cypresses, Platanos that of plane-trees. But the trees have disappeared, the mountains are denuded down to the rock, and the rivers are dried up, the Cephissus and Ilissus of Attica are but feeble brooklets.

Here and there may be seen occasional bunches of trees, pines, firs, evergreen oaks, relics of bygone splendour; Samos, formerly covered with forests, has now but a few scanty groves. The Ionian islands alone have kept their verdure, and Zante has 200 souls per square kilometre, whilst Greece has but 30.

The depopulation began as soon as the decadence, and was noted by the Latin authors. Plutarch says "the oracles have ceased because the places where they spoke are destroyed, hardly could 3,000 fighting men be found in Greece at the present time." Strabo says "I will not describe Epirus and its environs, because these parts are utterly deserted. The depopulation, begun long since, still continues, so that the Roman soldiers camp in the abandoned houses."

Italy itself has suffered in the same way. Titus Livius says "I shall be asked whence the Volscians could have gathered enough soldiers to go on warring, after being so often defeated. There must have been an infinite people in these regions which to-day would be deserts were it not for a few Roman soldiers and a few slaves." To this day the Appenines are denuded and the Roman campagna is desolate and sterile.

Sardinia is depopulated and unhealthy, but when the Romans took the island, after three centuries of Carthaginian rule, it was rich, flourishing, admirably cultivated, full of towns and inhabitants.†

Nearer home we find the same disasters, though the professed historians give us little but battles and anecdotes. Dalmatia was formerly covered with forests and had 2,000,000 inhabitants. The Venetians destroyed the forests and ruined the country.

But Spain is the country whose rapid and spontaneous fall has been most striking. No country was more flourishing in the sixteenth century under Charles V and Philip II; its European and Colonial possessions were vast, its riches immense, its victories numerous. Yet in the seventeenth century its prosperity and

\* Schliemann: *Récit des recherches et découvertes faites à "Mycènes et à Tyrinthe."* Translated by Girardin, Paris, 1879, p. 77.

† Lenormant: *Histoire Ancienne*, Vol. VI., p. 634.

power all disappeared without any visible shock from within or without. In less than a century Spain declined among the second-rate powers. In the seventeenth century, scarcity was the normal state of things in the centre of Spain. In 1664 the President of Castille, followed by the executioner, was requisitioning the provisions which the people of the Madrid campagna were hoarding up for themselves. In 1680 the workmen of Madrid formed organised bands for the purpose of killing and plundering. In 1699 Stanhope writes "not a day but some are killed in the streets fighting for bread." This state of famine lasted throughout the latter half of the seventeenth century, and probably until the density of population was reduced to the level of the reduced means of subsistence.\*

In the beginning of the eighteenth century, the capital, Madrid, fell from 400,000 to 200,000 inhabitants, the whole province of Castille was ruined, Burgos was but a name, Segovia was impoverished. The depopulation was due to famine, and the famine was caused by drought. The Ebro which in Vespasian's time, according to Pliny, was navigable from Varia up to Logrono, was in the time of the Moors only navigable for 15 miles; by the early seventeenth century Tortosa became the limit.

Under Peter the Cruel in 1350 the Guadalquivir was still navigable up to Cordova; Saragossa was a great centre of ship-building. In the sixteenth century the Manzanares was navigable almost to Madrid; to-day in ordinary weather a glass of water cannot be had from it. In Arragon, wine is mixed with the sand to make mortar, rather than use water. The huts are built of stones laid in red mortar, for it would be unheard-of sacrilege to use the scantily-dropping water coming from the fountains.†

A journey across Spain makes it easy to realise the cause of this absence of water; the trees have disappeared. Where formerly wheat grew and men were born there is now to be seen nothing but a crop of thin grass so scanty that the few poor flocks of sheep can only exist by continually migrating. Formerly the flocks ravaged the finest provinces, for they belonged to a powerful corporation which forbade all culture in the lands which they overran. Thus the plateau of Castile is now reduced to such a condition of nakedness that, according to the proverb, the travelling lark has to carry its own grain along. Water is absent from several parts of the plateau. Numbers of towns or villages which possess a spring proclaim the joyful fact by their very names. The Central Provinces where life was intense, the link connecting all the peripheral efforts, are become desert. The consequences are not hard to follow. Though the littoral provinces have suffered

\* Fückle : *Histoire de la Civilisation en Angleterre en France, en Espagne et en Ecosse*. French translation. Paris, 2nd edition, 1881, Vol. V., p. 16.

† Elisée Reclus. *Histoire d'un ruisseau*, p. 211.

less, thanks to the sea which still supports a numerous population, the heart of the country is paralysed. It is as though, in France, the basin of the Seine were to become nothing but pastures. Hence the depopulation, the impoverishment, and the intellectual decadence.

#### IV.

In our times decadence is threatening the nations that destroy forests. Comparing the wooded areas of the European states, it is seen that those which are the most wooded are also those which are increasing most rapidly in population and power. While France has barely 16 per cent. of her territory wooded, and Italy has about the same, Russia has about 40 per cent. and Germany 24 per cent.

The latter lay great stress on sylviculture and begrudge no expense for deboisement, distributing plants at cost price to communes, associations and private persons, and granting financial assistance to those who will replant. On the other side, Portugal has only 6 per cent. of her territory under wood, Spain has only 3 per cent, Persia 5 per cent. Let us consider France, which interests us more particularly. Since the days of the *ancien régime* France has lost about half her forests, for Mirabeau, in his 'Theory of Taxation,' estimates them at 17 million hectares, whilst they are at present only 8½ millions, for the greater part coppice and open woods : five or six million hectares of these so-called forests are only scrub of practically no great value. But it will be urged that we have a Forest Administration and wise laws, credits to boot, for deboisement. A perusal of works on Forest Economy will be instructive, for it will reveal the appalling state of dilapidation into which has fallen a component without which civilisation becomes impossible. It will show that the little deboisement done by the administration is largely counterbalanced by the destruction going on all around. Since the foundation of the present administration in 1825, the wooded surface has diminished by 750,000 hectares ; the communal forests, covering 1,900,000 hectares, are in a pitiful condition. They are steadily disappearing by three outlets, pasturage, the removal of dead leaves, and special fellings. As to private forests, the owners have destroyed within the last 50 years more than 400,000 hectares, while more than half of those remaining are nothing but wretched scrub which does not pay for its taxes and upkeep. Even the domanial forests are exceedingly difficult to protect from the greedy grip of the electors.

Proceeding to the provinces it is seen that the forests become scantier and scantier towards the south-east. The effects of deboisement are nowhere more apparent than in the Departments of Basses and Haute-Alpes\* Formerly those forests were

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\*M. Maury : *Les Forêts de la Gaule et de l'ancienne France*, Paris, 1867.

protected. In the thirteenth century, according to J. Roman\* the citizens of Briançon passed an Ordinance forbidding any felling in the forest of Pinée, whose disappearance would entail that of several villages. In Dauphiny, at about the same time, Humbert II passed an Ordinance to forbid the cutting of trees along roads; the close relation between roads and forests had been perceived. In the fifteenth century the town of Embrun protested in vain against clearing. These have gone on ever since. Thus the forest of the Gapençais has all but disappeared, Dévolny is perfectly bare, there are no more broad-leaf forests in the Embrunais and the Briançonnais. Places cultivated in the sixteenth century have had to be abandoned in consequence of the increasing severities of climate. The vine has lost territory. In certain localities the roads have been again and again removed to new alignments, but to no purpose. The Durance, navigable in Roman times, no longer carries enough water for the irrigation canals. In the ten years from 1842 to 1852 the cultivated area in the Basses-Alpes decreased from 99,000 to 74,000 hectares. The two departments, which before 1790 had 400,000 people, have now only 280,000. It is the same for the Lozère, which under Louis XIV had 150,000 people, and has now only 141,000. It is the same in Corsica, where clearing is still being actively pushed on.† They are even felling the chestnut trees, whose fruit provides the peasant's only food, because the Germans will buy them to make gallic acid. It is the same in the Pyrenees, the Limousin, &c., &c.

Doubtless the depopulation of France is the result, in a great measure, of voluntary restriction, but deboisement must also be allowed to be a cause, the importance of which is shown by the work of M. Jeannel. The population-rate diminishes most in the cleared Departments, that is to say, in those where the State has had to undertake the restoration and preservation of the mountains at its own cost. In these Departments, from 1871 to 1891, the increase of population, which should have been about 33 per cent, was at first hardly 16 per cent, and finished up the last quinquennial period with a loss of 89,682 inhabitants.‡ whilst the other Departments showed an increase of 89,682 inhabitants.

During 1891, for all France the deaths exceeded the births by 10,505. The cleared Departments showed a death excess of 11,885, that is to say, they provided the excess-deaths for the whole of France, and 1,880 more deaths into the bargain. For 1892, the death excess for all France was 20,040. To this excess the cleared Departments contributed 16,028, that is to say, out of all proportion. Taking the total population of the various

\* Roman : *Sur les causes du deboisement des Montagnes*. Gap. 1817.

† D. Donati : *Congrès de l'Association pour l'avancement des Sciences en carse*, 1901, vol. II, p. 898. This Author reports that the Agricultural Societies and the General Council desired to put a stop to this state of things, but that nothing could be done in face of the rights of property.

‡ Jeannel : *Association pour l'avancement des Sciences*. Congress at Marseilles, 1891, vol. II, p. 1021.

Departments, it is seen that in the cleared Departments the deaths have been 1·64 per 1,000, whilst in the others it was only 0·18 per 1,000. Granting that the clearance of mountains must prejudice the plains also, it is clear that since the Departments form our united whole, the effects of deboisement are even more serious than is claimed by M. Jeannel. Statistics show that depopulation works differently in the cleared Departments from what it does in those where voluntary restriction rules. In the latter, the hygienic conditions are good, the expectation of life is high, and deaths are few, but the births are fewer still. On the contrary, in the cleared Departments besides the differences in the birth and death rates emigration comes into account. The people seek elsewhere the food denied them by their own place.

Having studied the effects of deforestation, it is well to seek the causes. They are of various kinds.

The most important is *civilisation itself*. Civilisation increases the sale value of wood, and provides the means of transport without which sales would be very limited. It awakes greed in the mind of the landowner and at the same time allows him to satisfy his greed. Thus the barest countries are always the seats of the oldest civilisations. Certainly, when the landowner finds it to his interest to plant, he does not hesitate to do so. Thus the truffle industry has caused the plantation of more than 60,000 hectares of oaks in Vaucluse; and recently the oil trade has caused the plantation of an immense olive forest round Sfax in Tunis. But such cases are quite exceptional.

The cutting of trees is a source of immediate profit, but it entails later a great diminution of revenues. Hence reboisement meets with great difficulties, not only in the want of money, but in the hostility of the inhabitants. These people were originally hunters, woodmen, petty cultivators, but especially herdsmen, enjoying rich pastures and large herds of cattle. The destruction of the forest forces them to change their livelihood. They become shepherds and goatherds, for these are the only animals which can exist on the soil when it has become impoverished. These animals live on young shoots and buds, and prevent the forest from growing again. The shepherds themselves oppose every attempt at reboisement, pulling up young trees, destroying seedlings, &c., for they fear to lose their living. They even burn the forest in order to obtain further areas, until the mountain disintegrates and their last resources are swept away by landslides and erosion.

The political condition is of great importance. A strong Government enforces respect for the forests. It is thus in Germany. There (they hold it a great mark of distinction) the forest administration organised by the Great Frederic is still feared and obeyed. It used to be the same with us; Sully, Henri IV, Louis XIV, successfully conserved the forests, which were then rigorously protected. When the Revolution came, every political

shock took effect on the forest. The peasant's most glorious proof of his new-found liberty was to go and fell trees in the State forests. In his *History of France*, Michelet says "trees were sacrificed for the most trifling uses; two pines would be cut to make a pair of wooden shoes. At the same time the goats and sheep increased and multiplied, took possession of the forest, damaging young trees, devouring young shoots, and destroying all hope for the future." Another author, Ch. Comte, says "I have seen the torrents formed on newly-cleared mountains sweep away not only the soil, but trees, rocks, houses, and spread terror among the valley populations. It was the same in 1830, in 1848, and at every violent political change.

What the Revolutions did transitorily is now done permanently by the Parliament-parody which now governs us. The deputies dare not resist their electors for fear of losing their seats. "At present," says L. Tassy,\* "no Government has been strong enough to restrain the greed of the communes in the matters of special fellings and dead leaves, to confine the grazing of cattle within proper limits, or to insist upon the expenditure necessary for urgent works and for the due execution of working-plans. Worse still, our masters oppose even the very moderate measures of protection that lie within the power of the forest administration." "How many times," says the same author, "have we not seen conservators disavowed, almost disgraced, because their just indignation at some spreading abuse had driven them to some protective action."

For the most part, the deputies sin in ignorance, for they have never studied anything to fit them for their position. In the political world forest questions are considered of small importance. The law of 4th April, 1882, on the restoration of mountain slopes, relied on the help that might be given by communes and private persons, and whittled down to nothing the powers of the administration responsible for the results. In Algeria, private and communal forests have been created, but the budget of the administration has been reduced. (Budget of 1885 onwards.)

While the State is thus so badly neglecting its duty, all the authors who have studied the subject of deboisement are agreed that the State is the only possible source of salvation. They wish to forbid all clearings by communes or by private persons, and to make the private interest yield to the public good. A despotic Government can indeed enforce blind obedience on the part of its subjects, but in a republic, where every one is a judge and critic of policy, the best laws are useless unless the citizens understand their utility.

The great thing is therefore to spread the truth, which is after all known to very few. When the French come to believe in the

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\* L. Tassy: *Aménagement des forêts*. Paris, 1887. Preface, page XXIV.

Servian proverb "Who kills a tree kills a man," they will unanimously demand laws as strict as those which were so successfully promulgated a few years ago in Switzerland. Such laws would become less necessary if we had some powerful associations \* such as the American "Arbor day," which was founded in 1872, and has in 23 years planted 350 millions of fruit and forest trees in Nebraska alone. The Italian Minister Bacelli has recently followed this good example. He has instituted a holiday for the school children to plant with due ceremony a tree apiece in the Roman campagna. When shall we do the same!

### Notes on Sandal.

(Continued from page 267 of the *Indian Forester*.)

#### VI.--NATURAL REPRODUCTION.

32. Sandal is a prolific seed-bearer. Its ordinary and general fruiting season extends from June to September, but it also bears fruit rather sparsely between November and February. It is not uncommon to find at one and the same time trees laden with flowers and fruit from the nascent tiny flower bud to the ripe fruit ready to drop; this occurs more frequently in trees associated with a number of other species than in those growing isolated or in open scrub.

33. It reproduces itself plentifully from seed and to an appreciable extent from root-suckers also. The general paucity of seedling growth in natural sandal tracts is due to various disturbing causes which come into play *after* rather than *before* germination. I have frequently observed the ground under and round about parent trees carpeted with seedlings, but on subsequent inspection hardly 1 per cent of them were seen alive. This destruction of seedlings is brought about by several causes, the chief among them being (1) *fires*, (2) *trampling and browsing by cattle and wild animals*, (3) *exposure to excessive sun and rain*, and (4) *dampness and drip*. It is needless to enter here into a detailed account of these hurtful causes, for they have been fully dealt with by previous writers on the subject.

34. I shall now confine myself to a few observations on the conditions under which natural reproduction is found successful in certain localities on the Javadis.

In February 1903 I noticed a large patch (about 5 acres) of low bushes on the western slope of a ridge overlooking the Chittoor village. A few sandal trees were scattered about this area. On examining the bushes, which consisted of clumps of coppice shoots partially browsed down, I found sandal seedlings

\* There are but four anti-deboisement societies in France; at Nice, the *Société des Amis des Arbres des Alpes Maritimes*, founded in 1892 by Dr. Jeannel; the *Société Forestière de la Franche Comté*, and daughter of the preceding; the *Société des Amis des Arbres*, founded at Paris in 1895, and the *Signe du Reboisement de l'Algérie*, founded in 1881 by Dr. Trolard.



varying from 6 months to 3 years of age in almost every bush. All the grasses and other herbaceous growth between the bushes had been close-cropped by the village cattle and the area therefore enjoyed immunity from fire. My own observations and enquiries revealed that this area had been subjected to shifting cultivation (*ponnakáded*) four years previously. The bushes were of coppice re-growth from trees and shrubs felled when the land was brought under cultivation. The sandal seedlings were numerous enough to impress me with the idea that there was at least one on every square yard of the whole area. Even in an artificially-raised plantation, one could not desire a more numerous or more regular distribution of the young plants, all of which looked healthy and the majority vigorous. Adjoining this patch, there is an older *ponnakád* said to have been abandoned about ten years ago. In this area the coppice re-growth is much taller and denser. I found sandal seedlings of different ages in this patch also, but they were not quite so numerous, though sufficient to stock the area with a normal crop of mature trees, provided they escaped destruction by external causes before attaining their exploitable age. Elsewhere also I have observed successful natural reproduction only under similar circumstances.

35. What then are the conditions favourable to sandal reproduction in *ponnakáded* lands which produce such satisfactory results? Such an inquiry cannot fail to be instructive and interesting, and to my mind the following are among the most important conditions that favour natural reproduction in such lands:—

1. The worked-up and friable condition of the soil serves as a good seed-bed and facilitates germination of sandal seed.

2. The lateral roots of existing sandal trees, if any, are exposed and injured during the process of tillage and root-suckers shoot at all injured points, thus supplementing the young crop of seedlings in stocking the area.

3. The young coppice bushes protect the tender seedlings against cattle and wild animals, and shelter them from the injurious effects of the sun, rain, and violent winds.

4. The young and vigorous roots of the coppice growth enable the tender sandal to draw its nourishment from them by forming root attachments. That this is really the case has been established beyond doubt by Mr. Barber's investigations and amply confirmed by my own subsequent observations. I am inclined to attach the greatest importance to this *factor*, because it enables the sandal to grow vigorously from the very commencement and to establish itself firmly in the soil, thus acquiring a capacity to withstand injury, which a seedling unattached to other plants can never hope to possess or acquire.

5. Immunity from fire which the seedlings enjoy, chiefly due to depasturing by cattle and partially to the obstruction that the coppice bushes themselves present to the advancing fire.

6. Admission of light and air to the seedlings and to the soil with sufficient protection that the coppice bushes afford against the scorching rays of the sun. This is rendered possible by the free roaming of cattle, which prevents the interlacing of the coppice bushes which would otherwise form a dense lateral cover. This free play of air and light not only benefits the sandal seedlings directly, but also prevents their damping off by encouraging evaporation of any excessive moisture in the soil.

7. As goats are not excluded from such unreserved lands, it is possible that they nibble off the succulent tops and branches of the young coppice shoots, thus preventing choking and suppression of the tender sandal by overhead cover of the coppice bushes. This may at the outset be beneficial to the young sandal, although the evil effects of goat browsing might eventually prove disastrous to it at a later stage of growth.

36. It may be asked whether the admission of cattle and goats into sandal tracts does not cause infinitely more harm directly to the sandal than the very small indirect service it renders. While admitting that it does so the admission of cattle may be disadvantageous, I do not hesitate to record my conviction that where really successful fire protection is impracticable, the intrusion of cattle may make it possible, and sandal seedlings may therefore be saved which otherwise would be destroyed. It is perhaps a case of choosing the lesser of two evils, but as previous writers on sandal have forcibly stated, of all the enemies that sandal has to contend with, *fire* is the worst and the most dangerous. It not only annihilates seeds and seedlings, but also kills grown up saplings and even mature trees. Some years ago I inspected a fire-protected area in which sandal trees of 2 to 2½ feet girth were growing vigorously. An incendiary set fire to it; I inspected it immediately the fire occurrence was reported and again a year after. At the latter inspection I found almost every one of the trees had died after a feeble attempt on the part of a few to send out a few miserable shoots at the base which had also withered, while naturally all the younger sandal growth had been destroyed completely. Domestic cattle, assisted even by goats, could not have succeeded even after ten years of free access to the area in destroying sandal so completely as a single fire had done in the course of a few hours!

37. Before proceeding to discuss the question as to what extent and with what modifications the methods adopted by nature in reproducing sandal in *ponnakādel* areas may be followed in regenerating that species, I propose to make a short digression by way of a brief enquiry into the possible conditions under which our existing sandal areas could have come to be stocked with it. In dealing with this subject, I shall base my remarks chiefly on information gathered by direct observation and study of the sandal tracts on the Javadis and Yelagiris and by making enquiries of the inhabitants of these hills.

38. Where do we find the bulk of natural sandal on these hills? We find it not in the virgin forests of which we have still a few small remnants here and there, not in the luxuriant ever-green sholas which grace the highest peaks, nor in the heart of massive forest blocks away from human habitations; we do not even find it on forest land in the proximity of such habitations, unless it has been tilled once by the hand of man. In fact it is found only on lands cleared, cultivated and then abandoned to relapse into their primitive sylvan state. Trees of the species are found in appreciable numbers on the following classes of lands:—

(1) Lands now under cultivation. On such they are few and scattered.

(2) Hedges of cultivated lands.

(3) Old fields abandoned comparatively recently and on which young scrub has come up.

(4) On forest lands subjected to shifting cultivation for two or three years and then left to reclothe themselves with vegetation. We have such lands of all ages, and it is on the older of them that we find abundance of sandal trees in all stages of growth. These comprise the largest and the best sandal areas on the Javadis and Yelagiris.

(5) Narrow belts of forest reserve hardly exceeding a furlong in width and bordering on the above four classes of lands. Such belts are sparsely stocked with sandal which must have spread from the cultivated lands very slowly and gradually.

39. In the interior of dense forests, whether evergreen or deciduous or even scrub, we find little or no sandal. Where isolated patches of it exist in such localities far and away from existing villages, enquiries and observation have satisfied me that those patches were once the sites of deserted villages or abandoned cultivation. Such, for instance, are the sandal patches of Mundapatti and Settupatti on the Javadis. From the articles and reports of Messrs. Pigot, MacCarthy, Ricketts, Colonel Walker, P. M. Lushington and others that have appeared from time to time in the *Indian Forester* and elsewhere, it is to be gathered that in all provinces and districts in which it is found natural growth of sandal is confined mainly, if not entirely, to the same descriptions of lands as those on which it is found on the Javadis and Yelagiris.

40. The foregoing remarks naturally suggest the following two questions: (1) Why does not sandal occur in dense forests high or low? and (2) why does it confine itself to lands once under cultivation or to their immediate neighbourhood? I have already in this article attempted an answer to the *second* question, and shall therefore pass on to a brief consideration of the former. In natural dense forests, the leaf canopy being complete, (1) sandal seeds and seedlings are deprived of the free circulation of air and sunlight which are essential for the germination and growth

of the seedlings; (2) the soil being covered with a more or less thick layer of decaying leaves and twigs is very moist and cold, and consequently seeds and seedlings are damped off and killed; (3) such of the seedlings as survive or escape dampness and drip are suppressed by the overhead cover; (4) there being generally an absence of bushy undergrowth in canopied forests, the seedlings are exposed to trampling and browsing by cattle and wild animals; (5) when seedlings make head in spite of the above causes, they are destroyed by fires which occur almost annually; (6) it is also probable that the absence of an adequate and suitable undergrowth deprives the young sandal of the chance of forming sufficient root connections with other species and thereby of acquiring the requisite vigour and power for it to hold its own in the struggle for existence.

41. In open forests also sandal is absent, because, *firstly*, the soil being hard, dry and impervious by exposure to sun and rain and constant tread of cattle, does not give suitable lodgment for the seed; *secondly*, the delicate seedlings that may come up succumb to the influence of the tropical sun; *thirdly*, the occurrence of fires in such forests is more frequent and destructive owing to the dense growth of grass and other rank vegetation; *fourthly*, the hardness of the soil retards and checks the rapid development of its root system, and consequently the formation of adequate root attachments with other species. These causes, among others, are I think sufficient to explain the absence of sandal in natural forests.

42. In spite of the unfavourable factors mentioned above, it may be broadly stated that the area under natural sandal has been slowly and gradually extending itself in narrow belts along the fringes of old sandal tracts. We have clear evidence of this in the Denkanikotta sandal tracts of the North Salem Division. These tracts, as they then existed in isolated patches, were indicated on a stock-map prepared under the direction and supervision of Colonel Campbell Walker in the year 1869. We now find the areas between those patches fairly stocked with sandal. This process of natural spread of the species is no doubt very slow, but considering that it has had to contend with so many adverse influences, the progress it has made within the past 35 years appears hopeful and encouraging.

43. I now come to the question how best can we aid and foster the natural reproduction of sandal? I would suggest our following nature in her methods of reproducing it in *ponnakâded* areas as described in previous paragraphs. I would select lands wooded with species other than sandal and valuable timber trees such as teak, black wood, and kino (*Pterocarpus marsuïum*) within its natural habitat and allow them to be *ponnakâded* for a year or two, taking care to leave uncut as many trees of the species much preyed upon by sandal roots as may be compatible with sufficient admission of light and

air to the ground below and the avoidance of drip. When the cultivation is abandoned at the end of the first or second year, clumps of coppice come up from the cut stools of trees and shrubs. Sandal seeds shed by trees standing on the lands or brought by birds from outside find lodgment in the coppice clumps and soon germinate and grow up under their shelter. Where the land is not naturally sown with sandal sufficiently by the above process, I would dibble in the seed amongst the clumps in June or July at the first burst of the south-west monsoon. If the areas thus sown are within managable limits, they may be protected from cattle and fire. But if the growth of grass is high and dense and there is danger of the young sandal being choked, I would allow light grazing in order to reduce the grass; this no doubt may cause some damage to the sandal seedlings, yet it will be less than the damage by choking, especially as the coppice clumps protect them from the bite of cattle. Of course, goats must be altogether excluded. The sandal seedlings will establish themselves quickly by the development of their root system which is facilitated by the friable condition of the soil, and by the formation of root-attachments with other species. If the coppice shoots threaten to suppress the sandal seedlings by forming overhead cover, they may have to be lopped to leave the growing crowns of the sandal free. In the course of seven or eight years sandal grows beyond the reach of cattle, which may then be more freely admitted. Of course the areas must be protected rigidly and *successfully* from fire; where this is not possible it is better to allow grass and herbaceous growth round the sandal to be close-cropped by free admission of cattle from the very commencement. In open and bare lands natural reproduction will be successful only when they are covered up with shrubs and bushes, whose shelter and hospitality are so essential to the growth of the sandal seedlings. Therefore in such lands we must foster the growth of other plants which are its favourite posts before we attempt regeneration of sandal by natural means.

44. To my mind the above method of natural regeneration of sandal is the simplest and the cheapest. When the same process is taking place in nature so successfully, I see no reason to doubt its success if carried out by man. Within the natural habitat of sandal we have large areas of forest land stocked with soft wooded and inferior species which yield little or no revenue. We cannot utilize such lands for any better purpose than that of growing this valuable species which gives the largest money-return as compared with that of any other forest timber tree. In undertaking this method of natural regeneration it is better and safer to take up small areas and to carry out the operation efficiently rather than to undertake it on a large scale, which might be unmanagable, and therefore unsuccessful in its results.

(To be continued.)

Sulem.

M. RAMA RAO.

## II.—CORRESPONDENCE.

**Fire Protection in the Teak Forests of Burma.**

## I.

1. During the last few years the above subject has caused a good deal of discussion, principally verbal, in Burma; but with very few exceptions officers have been chary of writing their views on the matter. With a view to provoking an expression of opinion on the whole matter from officers of experience, I have attempted to deal with the *pros* and *cons* of the subject as they appear to me after having had charge of many of the most important teak areas in Burma. I must premise, however, that these remarks only apply to the Burma teak forests and not to fire protection generally, and that I have had to make them as short and undiscursive as possible so as to keep this note within due limits.

2. The principal advantages of fire protection may be stated as follows:—

(a) Improvement to the soil through decomposition of leaves, branches, etc., and protection of the same from denudation owing to the covering of fallen leaves breaking the force of the rain.

(b) Protection of young seedlings, and to a certain extent of larger trees, by saving them from being burnt to the ground, scorched or otherwise injured.

(c) Protection of logs and fallen material lying on the ground.

The main disadvantages are:—

(d) Loss of germinating power in the teak seed owing to want of the scorching natural to it, and in places owing to its inability to reach the ground owing to the mass of leaves.

(e) Choking of young germinated seedlings owing to the prolific growth of grass and quick-growing soft woods.

(f) Increase of insects.

(g) Impassability of forests owing to the accumulations of dibris, and undergrowth.

(h) Estrangement of villagers owing to the restrictions which have to be enforced in the neighbourhood of the areas.

(i) Loss of nearly the whole of the working season to the Divisional Officer and a large part of the staff owing to their labours having to be directed entirely to fire-protection operations.

(j) Closing of the forests to work.

3. I will now deal with each of the above points separately, and then state the system which I consider they indicate. The beneficial action of protection on the soil (a) is probably not denied by anyone, especially when the soil is naturally poor and on steep slopes, but its paramount necessity in a typical teak forest is at least doubtful. In a typical teak forest one finds

a practically complete cover which of itself breaks the force of the rain, while the slopes are of a more or less easy gradient, and in a forest of this description I have never seen the soil carried bodily away in the heaviest rain. As regards improvement of the soil by the decomposition of the leaves, it must be remembered that in none of the Burma forests has true humus been formed, and under the circumstances as long as they enter the soil and are not washed away, the ashes produced by their burning would probably have nearly as much effect as the slowly decomposed leaves themselves (except for the loss of gasses). Experiments were started to prove the extent of gain in fertility to the soil from protection, the increase in girth growth of teak being the basis of the same. I have not heard the result lately, but to begin with they were certainly negative. The soil is also supposed to get baked on the surface by fires, but as the seed does not attempt to germinate till the soil is saturated with rain and quite soft I do not think this can do much harm.

4. The loss of young seedlings from fire (b) is undoubted, and although despite fires seedlings grow up it is at the loss of several years' growth, estimated at 10, and at the cost in many cases of scars near the ground. On sound fairly large trees I don't think fire has any effect at all till they begin to lose vitality or unless an exceptional amount of débris is collected round them. To trees which are losing vitality or which have wounds at the base, fires cause great damage, and ultimately destroy them, unless they are felled and removed. This always ought to be done at the time the area is exploited if the tree will yield a marketable log, so that one need not lay too much stress on this in considering the result of protection.

5. The protection of logs (c) is unimportant in the present discussion as whether the forest is fire protected or not, the logs should be stored in such a way that fire entering the area accidentally will not reach them. In unprotected areas there is bound to be a loss of naturally fallen trees, owing to the fact that successive exploitations of any particular area can, as a rule in this country, only take place at long intervals. If the whole area could be worked annually, the loss under this head would be insignificant, but as things are, fire protection is distinctly valuable in this connection.

6. The improved germinating power of teak seed (d) which has been slightly scorched was experimentally proved in Tharrawaddy many years ago. The effect of a thick layer of leaves such as is found in a fire-protected forest in preventing the radicle reaching the ground is known to every Forest Officer; it should be noted, however, that this effect would only be observed in the drier forests where a considerable number of leaves have fallen before the teak seed: in moist forest the teak seed falls before the bulk of the leaves do, and the latter would not therefore prevent the radicle reaching the ground, although they might

affect the upward development of the seedling. Fire protection thus seems to be distinctly prejudicial to the germination of the seed.

7. The choking effect of grass and shrubs (*e*) is a necessary corollary of the light demanding nature of the species, and has been observed in many fire-protected areas in Burma, and was also observed, I believe, in the Central Provinces by Mr. Fernandez. If the old grass was burnt off before the teak seed germinated, it would be bound to have a better chance of getting through the new grass than it would if it had to force its way through a thick mass of old and new grass together.

8. Insect pests (*f*) are bound to be fewer in number in an area over which fire annually runs than in an area which is never burnt. The exact amount of damage caused to any particular class of insects by fire can only be stated when its life-history is exactly known, but in most cases it is probably considerable, and is so much gain to the forest.

9. The impossibility of fire-protected forests (*g*) is especially noticeable in areas where the bamboo has died, and any one who has had to work in a forest under these conditions is not likely to forget it. Otherwise this is not an important point except to the shikari.

10. The restrictions which have to be put in force in order to ensure successful fire protection (*h*) sometimes tell rather hardly on neighbouring villages, and at all times are felt by them as hardships. This is not an important point as they get accustomed to them in time, and, moreover, if only they could be got to see it fire protection does them more good than harm in the amount of employment it gives them.

11. The great amount of time which the Divisional Officer has to devote to fire protection is, in my opinion, one of the greatest drawbacks to indiscriminate fire protection. Very nearly from the commencement of the working season he has to be running about from one end of the district to the other, first seeing that the traces are properly cleared, then seeing that the watchers do their duty, and then enquiring into fires, or making sure that none have occurred and not been reported. However capable his subordinates, the Divisional Forest Officer is responsible for the above, and may not delegate his duties, and consequently all other work must slide. Again, fire-protection measures have to be taken in hand just at the time timber traders do most of their work; in many cases this occurs in a beat where fire protection is going on, and the beat officer being bound down to his traces is able to keep no sort of control over them. In this division no less than ten beat officers have had to be employed in the protection of four reserves, and from February or earlier till May, people have practically been able to do as they like in their beats.

12. The closing of forests to work principally affects extraction by carts which must be done during the dry season as a



rule, and the greater part of this time is included in the fire season when carts cannot be allowed in the reserves. This causes a great hindrance to trade which is dependent on carts from other parts and which are only free to come in the dry weather, for instance Tharrawaddy.

13. The above points have been treated very generally, and subsidiary points might have been discussed *ad infinitum*; but in the light of them and my knowledge of the fire-protected areas in Burma, I have come to the conclusion that fire protection is too widely and indiscriminately applied in Burma, and that the resultant advantage is not commensurate with the expenditure of time and money. Speaking broadly, I consider that fire protection should be confined to such areas as have young regeneration on the ground, either natural or artificial, except in cases where it may be necessary to protect on account of erosion. These areas would not be protected for ever, but the protection would be continued till the saplings had got out of danger; at the most 12 years would be quite sufficient. This method would give greater leisure to the controlling and subordinate staff to carry out works of improvement and regeneration with which fire protection would advance *pari passu*. The above method would have to be treated on broad lines, *i.e.*, you must not try and treat an acre here and an acre there, the complications and cost of which would be ruinous, but must take up block after block in a regular system according to the capabilities of the staff. As a corollary to the above, I should give up the present rule which says "improvement fellings may only be done in a fire-protected area," and would say "improvement fellings should be done in unprotected areas and be followed by fire protection."

H. CARTER,

*Deputy Conservator of Forests, Mu Division.*

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## II.

If Mr. Gleadow had read carefully the heading of my article on fire protection, he would have noticed that I confined my remarks to the teak forests of Lower Burma. If he had read carefully a little further he would have gathered, I think, that I did not consider facts and statistics collected for Indian and European forests applicable to Lower Burma, and might have inferred that I would not urge the reverse to be the case. When he writes concerning my indiscriminate advocacy of fires in forests he implies, I think, that I am seeking to introduce fires into forests which have never been burnt. Were this the case it would be necessary for me to prove my thesis. The actual facts are that the teak forests of Burma have been burnt over from time immemorial, and as Mr. Gleadow advocates the *innovation* of excluding these fires I maintain that the burden of proof rests

with him. His reasoning, as I understand it, is that because "it is admitted and proved up to the hilt that fires are ruinous to forests in America, Africa, Australia and India, besides Europe," *therefore* unlimited expenditure is justified for Lower Burma forests, and that being cautious in all matters scientific he is slow to accept any facts or arguments showing the contrary view. Personally I am very sorry that Mr. Gleadow's forests have been ruined and sympathise with him in his efforts to "restore" them by fire protection. He has, I think, a very strong case for fire protection in India, America and the continents as above; but even the most ardent fire protectionist in Burma has never argued that these forests have been ruined. But if to take the most obvious measures to prevent damage to forests is sound reasoning, then can one logically argue that the temperature in many forests in Europe should be raised during the winter by a system of hot water pipes, because it is admitted and proved up to the hilt that frost causes great loss. But were this method proposed members of the orthodox church, of which I claim to be a humble member, would, I think, point out lucidly that benefits must correspond with the outlay involved and that proof must be brought forward to show that expenditure can be justified. To justify the expenditure on fire protection in Lower Burma it is, I think, necessary to show that the loss, direct and indirect, caused by fire protection, together with the cost of this operation, is counterbalanced by the loss from fire prevented.

Mr. Gamble in referring to fire protection in Burma once stated that "in forestry, in our view, it is the mature opinion of experienced professional men that is of more value than statistics." I have also known it stated that the question of fire protection should not be openly discussed. These views, which seem to me to be common, I rather inadequately describe as pharasaical. I still think such views unorthodox, but would prefer to describe them as unprogressive. The subject is far too complicated, and our senior officers hold far too contradictory and divergent opinions for any agreement to be reached, and therefore, unless the question is studied scientifically, as such questions are studied in Europe, I do not think there will be real or great progress in acquiring knowledge of our forests.

Mr. Gleadow was naturally annoyed at the "ingenuous brass" of a youngster like myself venturing to "lecture" a senior officer on caution, but although I apologize if I have expressed myself in any way offensively, yet I wish to urge in my defence that I am only repeating, parrot-like, lessons which I have learnt, perhaps imperfectly, from recognized authorities on forest matters.

I had imagined that the taproot of most species, except such as radishes and turnips, would be discarded or become merely subsidiary to the system of laterally branching roots owing to the fact that the root has to penetrate through a denser medium than

the stem, and that therefore when the growth of the latter becomes vigorous the taproot would be unable to keep pace with it and nutriment would be obtained from the laterally branching roots which are subsequently developed. As a matter of fact, I have pulled up a great many seedlings which have been burnt back by fire, and although in most cases I have found the taproot full of decay and twisted and deformed by fire, yet I have always found laterally branching rootlets unconnected with this mass of decayed tissue, and when examining older seedlings have always found that when the upward growth becomes vigorous the taproot ceases further to develop, and that at a very early age it is discarded. In sections cut across the stem of teak seedlings grown in unprotected forests I have been unable to trace any sign of decay having ascended from the taproot to the stem before the time that the former is discarded. I may have unintentionally exaggerated or have fallen into some error, or, on the other hand, it is quite possible that in drier climates where growth is less vigorous the taproot is never discarded. Mr. Gleadow need walk only a very short distance in the unprotected forests of the Pegu Yomas Lower Burma in order to find numerous sound teak seedlings. He would also see some perfectly sound teak trees 10 feet, 12 feet and 14 feet in girth which were probably many times burnt back as seedlings, and although they have been subjected to annual fires for some 400 or 500 years are perfectly sound. An "Old Protectionist" in the April number raises the same question. Yet in the Andamans, where fires are unknown, hollow trees seem to me to be as plentiful as in Burma. I certainly think that suppression by damaging the vitality of a tree may be a fruitful cause of hollowness, as when making thinnings in Burma in teak plantations which have never been burnt I have frequently found badly suppressed stems decayed at the centre.

In the April number also Mr. Manson sends as a rejoinder to my article an instance of actual damage caused by fire which was brought to his notice by Mr. Ross. Am I, however, to conclude that Mr. Ross when calculating for his working plan the annual loss caused by fire will take as the basis for his calculations the fact that he ascertained that in one area of 180 acres 9 out of a total of 26 sound mature trees were destroyed by fire in a single year? I think not, and I think this instance must be intended merely as an illustration of *abnormal* damage by fire. I read a working-plan prepared by an ardent fire protectionist some 20 years ago, and found that although the author theorized very greatly concerning the great damage done by fire, he made no deduction for this in his calculations.

However, although no deductions are made for loss by fire in unprotected areas, I believe the estimated yield is almost invariably obtained. If the figures bear out this assertion, then I argue that the damage in reality is less than that often assumed in imagination for purposes of theory.

As the case for fire protection depends almost entirely on the amount of damage done, I would ask whether any Forest Officer will attempt to give even the roughest estimate or guess of the amount of damage normally caused by fire in any type of teak forest in Lower Burma.

In a forest in which the struggle for existence is very keen owing to a rich soil and heavy rainfall, provided the valuable species is not much affected by fire but very sensitive to shade, whereas the thousand and odd worthless species are very sensitive to fire, but can bear considerable shade, it is clear that the value of a forest may be increased by annual fire. The case of teak in Burma is not so simple, but some of these conditions exist to a modified extent; so much so that I venture to think that we owe the large size of our revenue to the fact that our forests have been traversed from time immemorial by light leaf fires. This can be demonstrated by the theory of the survival of the fittest. Each species has the power of reproducing itself at an enormous rate, but its numbers are kept constant by continual competition. The abundance or scarcity of any species is determined by its powers of competing under any given set of conditions. As is well known teak is well fitted at all stages of its existence to resist fire, more so than most of its rivals, and therefore it is much more abundant than it would have been had the same conditions prevailed except that the forests had not been burnt. The same argument can be deduced from the statement which I noticed in the Administration Report of 1896 to the effect that Forest Officers in Burma are generally agreed that reproduction of teak suffers under fire protection. A Forest Officer's object is not so much to squeeze the maximum amount of revenue out of his forests as to improve them, and I think it could be shown from the expenditure that we depend principally on fire protection to effect this object. If, however, fire has been beneficial in the past, it behoves us to show all the more clearly that by now excluding it we are improving the value of our forests.

I possibly exaggerate the loss caused by fire-protection, but in those areas protected for any length of time the defects are very apparent. For instance, that part of the Kadinbilin reserve. Thairawaddy Division, between Kywemakain and Letho, is one of the oldest protected areas in Burma, and from the commencement some 40 years, has been successfully protected. Yet, in spite of improvement fellings hardly a teak seedling is to be found, although in adjoining unprotected areas natural regeneration of teak is very good.

That fire protection has defects is generally admitted, but I would ask whether they can be prevented. There are numerous remedies advocated, such as more extensive improvement fellings, intervals of non-protection, etc.; but I would ask whether any of these remedies have been found satisfactory in actual practice, as

my experience is that they are not sufficient and that fire protection renders many of the moister and richer areas unproductive of teak.

I would also ask whether fire protection is the most profitable method on which to devote our expenditure even if it can be shown to be advantageous. Even in unprotected areas teak is only found where most light is let on to the ground, in gaps or on ridges. Comparing the growth of trees which have been suppressed but not damaged by fire with the growth of trees which have been burnt at the base but not suppressed, as far as one can judge from an examination of the annual rings of stumps, I have come to the conclusion that shade is more detrimental to teak than fire. The present stock of teak produces sufficient seed to stock every available acre were it not for the competition with other species, and this fact points to the same conclusion. Our labour supply is very limited and usually consists of the lame, the halt and the blind, and the general riffraff of the poorer villages, for which we pay exorbitant rates, but such as it is I think it could possibly be more profitably devoted to decreasing the competition or lessening the shade than to endeavouring to exclude light leaf fires.

An "Old Protectionist" quotes M. Bagnier as follows "comme tout ceci repose sur, l'observation, la sylviculture est toujours perfectible." If, however, sylviculture depends on observation, it follows that observations should be carefully carried out and the resulting information systematized. Thus when I argued that possibly we were falling into the same danger with regard to fire protection that Forest Officers in England have fallen into with regard to thinnings, I intended to imply that we had not taken steps to collect reliable information, and that our observations had been too casual. There will doubtless be always much to learn about the growth of these forests which are very complex, but much could be learnt, and our sylvicultural operations might be improved, if observations were carried out scientifically as is done in Europe. For example, the type of forest in which teak is associated with *Kyathaungwa* is very uniform. The effects of fire and fire protection could be ascertained fairly accurately by selecting two areas of, say, 100 acres in each division, the one to be protected from fire and the other not, and recording at the end of the rains and of the hot weather the number of seedlings which spring up in each area and the number killed out by fire, suppression or other causes. In this manner fairly reliable information could in time be collected which would be more convincing than the inferences made by officers walking along fire lines from teak trees and seedlings which they seldom see a second time. The results would be in a practical form and more valuable than any amount of speculative discussion.

*Andamans.*

H. C. WALKER.

## III.

In an article by Mr. F. Gleadow in the *Indian Forester* for May 1904 he says, "all the world over (except perhaps by the Burmese) fires are and have always been the recognized enemies and destroyers of forests." By trained foresters in Burma the injury done to the *forest* by fire is not, I think, disputed. The question at issue is whether teak, being fire-proof compared with other species, does not gain in the struggle for existence by its competitors suffering greater injury than itself in unprotected forests. Few of us desire to prejudge this question, but we do desire to have it solved by careful and adequate experiment.

There is one point in connection with this discussion on fire protection that I do not remember to have seen raised.

Let us assume that fire protection

- (a) Does not render a forest area more malarial.
- (b) Does not encourage insect pests.
- (c) Is beneficial to the natural reproduction of teak.
- (d) Improves the rate of growth of teak.
- (e) Gives sounder timber.

Let us also assume that the expenditure charged to A VIII-F. represents the whole of our expenditure on fire protection, and that it is not necessary to add to this one-tenth the cost of our clerical establishment, one-fourth the cost of our gazetted establishment, and five-sevenths the cost of our subordinate forest establishment.

The question still remains, does fire protection pay at Rs.40 per square mile? In other words, is the teak contained in one square mile of mixed forest which has been protected (probably with varying success) from fire for 150 years worth Rs.6,000 more than it would have been had it not been protected?

G. R. LONG.

*Taunggyi.*

*P. S.*—It seems to me that if each Rs.40 as spent is calculated at compound interest at 3 per cent, that the total will be not Rs.6,000, but Rs. 2,55,750. This seems so horrible that I should like to have it checked by a mathematician.

G. R. L.

## IV.

I must ask you to enter a protest against Mr. Manson's article on page 155 of April's *Forester*. To attribute the absolute loss of nine sound green teak trees over 7-feet girth, to say nothing of the dead ones, to an ordinary jungle fire seems to me absurd. Any one who did not know our jungle fires would think they partook of the nature of an American forest fire instead of being, as they are, a creeping ground fire. If an ordinary jungle fire could

destroy all this in one year, it is evident there could be no teak trees in Burma as fires practically occur everywhere out of the protected areas. If no contractors or thieves have removed the trees, an error in enumeration would be a simple way to account for the difference.

SHWEBO:

8th May 1904.

H. CARTER.

## V.

During the working season 1900-1901 the writer was girdling in the Pegu Yoma teak forests of the Coongoo Division, Lower Burma; and during that time some detailed notes were made which may be of interest in connection with the discussion recently started. They have at any rate the merit of being facts.

The forests in which the observations were made are all bounded on the west by the Pegu Yoma watershed and are similar in soil and growing stock in the three reserves, Kabaung, West Swa and Kyaukinsin.

In all kyathaungwa (*Bambusa polymorpha*) is the prevailing bamboo, and the only other occurring to any large extent is myinwa (*Dendrocalamus strictus*). The latter naturally covers the dry and steep ridges, never descending any distance below them: below it, and covering by far the greater part of the area, is kyathaungwa, and in belts along the streams is evergreen forest with little or no teak, and dense masses of wathabok (*Teinostachyum Helferi*) and various monocotyledons. In the two upper belts teak, pyinma (*Lagerstroemia flos rejinæ*) and pyingado (*Xylia dolabriformis*) are the prevailing principal species, and in the lower kanyin (*Dipterocarpus laevis*).

The relative density of these species is, roughly, according to the working-plans

Teak	...	...	...	·1
Pyingado	...	...	...	·2
Pyinma	...	...	...	·005
Kanyin	...	...	...	·005
All others	...	...	...	·690
				1·000

The slopes are on the whole moderate and the whole area is covered with forest.

Notes were only made regarding those trees which were girdled; but as the number of these bears as a rule a constant relation to the total number of teak on the ground, the conclusions may perhaps be taken to apply to all the growing stock. It must be remembered, however, that as only the largest trees are girdled, the figures apply to those trees which have had most

time to be damaged by fire, besides being more susceptible to damage through diminishing vitality, than the younger stock.

In the accompanying table Class A includes those trees which were so much damaged by fire as to have lost a certain part of their commercial value. Each tree contained a cavity, sometimes a couple of feet near the ground, sometimes reaching from the ground to a height of fifteen or twenty feet. They were in the latter case only girdled of course if there was a fair length of sound timber above.

Class B includes those trees which although damaged by fire have not yet lost any of their commercial value. All trees were included in this class on which the heart wood was exposed to an appreciable extent. If only a few inches of heart wood near the ground were exposed, or if the large surface roots and small buttresses were burnt, without damage to the trunk of the tree, the trees were not included. Otherwise this class includes all trees with sapwood killed, in some cases on a few feet near the ground, in others to a height of twenty or twenty-five feet, in extreme cases only a narrow strip of sapwood remaining to keep the tree alive.

Reserved	Com- part- ment. No.	Area in Acres.	Total No. girdled.	Class A.	Class B.	Total per- centage damaged by fire.	Class of forest.
Kabaung ...	34	925	552	50	300	63	Karen area.
	35	686	217	29	101	60	
	36	1,977	133	16	50	50	
	37	613	365	28	206	64	
West Swa ...	33	712	1,192	64	650	60	Reserved forest.
	84	857	272	15	133	54	
	85	656	554	43	273	57	
	86	1,030	324	30	167	61	
Kyaukmasin...	23	663	350	24	177	57	
		7,219	3,959	299	2,057	60	

The uniformity of these percentages, obtained by making separate lists for each of the nine compartments, increases the value of the conclusions : showing that the notes were made in a



similar manner, and also that the results may be accepted for large areas, as the Kyaukmasin compartment is some five days' march from the Kabaung compartment, with the West Swa area between.

The four compartments in the Karen area, where the Karens cut taungyas every year, were certainly burnt annually: the others may occasionally have escaped, but it is not likely as they were not fire-protected.

In two other compartments of the Kabung Reserve, Nos. 32 and 38, in area together 1,786 acres, 1,900 trees were girdled, of which 1,070 were noted as having been damaged by fire, but no distinction was made between classes A and B. The percentage which these data give is 56, slightly lower than that obtained from the table above, but not so accurate.

It may therefore be accepted that in the best class of Yoma teak forests, where Kyathaungwa predominates and the forest gets very dry in the hot weather, 8 per cent of the standing stock of marketable teak trees have been so much damaged by fire that they have lost a considerable part of their commercial value: and further that about 52 per cent of the standing stock of marketable trees have been so damaged as to impair their vitality and lead the way to greater damage later on.

Judging from the appearance of the burnt trees, it is probable that the damage began at the time the last flowering of the Kyathaungwa bamboo took place. This was about 1852. During the next two seasons the forest would be full of immense masses of dead dry bamboos which would burn fiercely and damage the teak trees to a considerable height from the ground.

The next extensive flowering of Kyathaungwa is expected shortly, and it seems a reasonable supposition that after large fires on the flowered areas, many of the trees at present in class B would be found to have been "commercially damaged" and to be in class A.

The area on which these notes were made is, of course, very small compared to the vast extent of the Pegu Yoma teak forests, but the character of the forest is so uniform over thousands of square miles of the slopes of these hills that it is justifiable to place some reliance on the conclusions.

There are many dry shaly ridges, especially on the western slopes, for example in the Thonze Reserve in Tharrawaddy, which will show a higher percentage of damaged trees: and, on the other hand, there are many moist areas on the eastern slopes where it will be much lower.

THAYETMYO :  
16th May 1904.

A. RODGERS.

## **The Review of Forest Administration in British India, 1901-1902.**

In the *Indian Forester* for April last I have read a criticism of my review of the above report from the able pen of Mr. C. P. Fisher. The letter in question is a valuable production, in that the writer has been at great pains to hunt up and give us a number of valuable quotations from Government of India Reports, and quotations which, as Mr. Fisher finds, it is always useful to have by one when one wishes to show how the powers that be may (be it written in all due humility) perhaps be inclined to, at times, deviate from the path we think they should tread. For this reason we should thank Mr. Fisher for his painstaking endeavour to show in what a misguided spirit your reviewer wrote. As far as I have been able to see, however, and I have read the letter through very carefully several times, its value ends there. Mr. Fisher quotes the following sentence from my critique "no greater mistake was ever made than the comparison by Local Governments of their own progress in the preparation of working-plans with that of other provinces, &c." Your correspondent construing this sentence to animadvert solely to the Central Provinces would seem to show that the cap fits more especially tightly in that Province and in directions of which I am entirely unaware, for it is only in this way that I can account for his fiery championship of that particular Local Government. However, to exculpate myself in Mr. Fisher's eyes of the grave charge he prefers against me (there was yet a second if I remember rightly: I positively blushed to read that I could be considered guilty of the heinous offence of praising the Government of India for anything they had ever done!) I will relate the following short story. It was in my mind at the time I penned the lines your correspondent has so misinterpreted. A few years ago I happened to be present, in company with a Conservator of Forests, in the office of a Revenue Secretary to a Local Government (not that of the Central Provinces). The matter engaging our attention had not the remotest connexion with working-plans. The Conservator was not serving at the time in the Province, although he had done so prior to his promotion to the Conservator's grade. The Revenue Secretary, towards the close of our interview, showed us the Local Government Review on the Provincial Conservator's Report for the year which had just been issued. In this document the progress in the preparation of working-plans in the province in question was strongly animadverted upon and the backwardness of the province in this respect was compared with "the great strides made in this direction by the Central Provinces." The areas in both Provinces were alluded to and particular stress was laid upon the great disparity. My companion, the Conservator, at once pointed out the reason and endeavoured to explain his meaning. He was clearly not understood, and his arguments fell

upon deaf ears. To recapitulate the Conservator's arguments is unnecessary; I need only quote Mr. C. P. Fisher's opening lines: "*It is undoubtedly a fact that, in certain cases, working-plans have been prepared unnecessarily in the Central Provinces.*" Your correspondent has himself put the matter much more forcibly than I should ever have ventured to have done even if, which was not the case, I had wished my words to apply to one particular province--a proceeding which would have been most unfair.

YOUR REVIEWER.

### Sound Advice from Bombay.

In the *Indian Forester* for last February amongst the Miscellanea there is an extract with the above heading. The extract would have been more truly described if it had been headed "Unsound Advice from Bombay."

The extract is taken from the remarks made by Mr. F. S. P. Lely, Commissioner, Northern Division, Bombay, in forwarding to Government the Annual Report of the Conservator, Northern Circle, for 1901-02, and I venture to say that the remarks show an entire lack of appreciation of the nature of forest operations. The Commissioner opines that the nurseries in the Northern Circle are all based on a wrong principle, because "they are merely plots where seedlings of such trees as teak and tanach (*Ougenia dalbergoides*,) are reared and then transplanted to sections of forest area which must be of limited size even for the produce of a big nursery." Now, if by sections of forest area Mr. Lely had meant "blank\* in forest" his descriptions would have been accurate enough. But from what he goes on to remark it is evident that such was not his idea and he falls foul with the rearing of "teak and tanach," because the Forest Officer ought in his opinion to be experimenting with exotic plants and less known species. The object of the nurseries which are maintained in the Northern Circle is the raising of plants that are indigenous to the country, and those species are selected which grow best, will best bear transplantation and give the best results in timber, and surely this is true forester's work. The plants reared in the nurseries are not confined to teak and tanach as Mr. Lely alliteratively suggests, but include teak, various species of terminalia, *bassia latifolia*, *acacia catechu*, &c., &c., and they are intended for the filling up of blank\* and not for the reforestation of large areas, since such a work is too big to be attempted with the funds placed ordinarily at the Divisional Forest Officer's disposal. But Mr. Lely considers in his wisdom that "this method would be well enough for a private landholder who wanted to put a few hundred of acres under timber, but the Government forests are far too extensive to be treated as mere plantations." This airy reference to the private landholder would lead one to suspect that this individual

was in the habit of making plantations on his lands, but we all know that such unfortunately is far from the case, and Mr. Lely might preach to him about plantations with more advantage than to Forest Officers. He goes on to say that "the ordinary trees of the country should, it would seem, be regenerated by assisting natural reproduction and by direct sowing." Does Mr. Lely really think that Forest Officers do not in Bombay practice the first principles of forestry, or is it merely that having mastered the meaning of a few technical words he wishes to air his small knowledge? As for his recommendation of direct sowing he should, in the course of his long service in forest districts of the Bombay Presidency, have learnt by this time that direct sowing on bare tracts has been attempted "ad nauseam" and that nothing has resulted therefrom but weariness of spirit.

But Mr. Lely does more than merely criticise the Northern Circle forest nurseries. He gives us his ideas of what the nurseries should really be. He says they should be "central" for each Division "if possible at head-quarters and under the personal care of the Divisional Officer." But in this he is not original. The forest nursery at Godhra in the Panch Mahals Division is exactly of that description. "It should gradually take on the character of an experimental garden, where new products are being constantly tried and diseases and pests and other problems of interest being studied as far as may be." It should "also contain in time a complete collection of specimens of such of the forest products of the Division as can be turned to the use of man both in the living plant and in the form suitable for commerce." Why, the Dehra Dun Forest School Museum and Garden would apparently not bear comparison with one of Mr. Lely's central nurseries! According to Mr. Lely the expense of keeping up such a nursery is not worth mentioning; it can be looked after by the Divisional Forest Officer as part of his ordinary work, though how this is to be done when it is considered that the said officer can only be in headquarters for five months out of the year, is not explained. What Mr. Lely wants is a Botanical Garden, Museum and Laboratory, all maintained by one Forest Officer, in each division of the Presidency. And for what purpose? Simply in order that "a stranger on entering a district, whether bent on science or business, would find ready means of learning what the forest can produce!" Does Mr. Lely think that because mahogany trees, eucalyptus, sal and our old friend *Pithecolobium saman* can be raised from seed and made to maintain a struggling existence in a district to which they are not suited, that therefore these trees are interesting as showing what the forest can produce. Is not a fine crop of healthy teak and tanach seedlings growing freely a far more inspiring sight than such abnormalities? Let his problematical stranger go to the Botanical Gardens at Bombay or Poona, and to the Dehra Dun Museum, when bent on science or business or

both, or if he comes to a Forest Officer's headquarters, let him be prepared to spend a short time in the district and be taken into the forest and shown forest products "au naturel;" he will learn more and it will cost Government nothing.

I have only a little more to say about Mr. Lely's remarks. He likens Forest Reports to the "accounts of a timber merchant in a huge way of business who devotes himself to growing teak and bamboos and selling off his stocks at the best possible price." This is mere verbiage. Has Mr. Lely ever met or heard of a timber merchant who grew anything? The comparison is so absolutely inept that it is not worth discussion. Forest Reports, *pace* Mr. Lely, do show advance yearly, and the consciousness of further advance being required, but Conservators are confined to twenty pages of print for their reports and ordered to omit new suggestions or possible contentious matter since such are out of place in an Annual Progress Report. The combined effect of these orders is that reports are somewhat dry reading, and it is therefore not difficult to make carping remarks about them. Then Mr. Lely attacks the Forest Department because "not much effort is made to meet the demands of industries that have established themselves off the beaten track," and quotes the match-making industry which "needs a certain class of wood which will be exhausted in a very short time, but no attempts to keep up the supply have been heard of." The "certain kind of wood" is *Bombax malabaricum*. Will it surprise Mr. Lely to hear that the match-makers refuse to pay Government a higher rate than 2 annas per cart load for taking this wood from forest? and does Mr. Lely think that it would be profitable to Government to undertake the growth of this wood for subsequent sale at such a price? I think it must be admitted that the Forest Officers of the North Circle, Bombay, are doing better work in fostering the growth of Mr. Lely's despised teak and tanach.

G. P. M.

### **Reproduction of Teak in Bamboo Forests in Lower Burma.**

In an article on page 51 of the February number of the *Indian Forester* Mr. H. C. Walker appeals to Forest Officers in Burma to record their views as to the best means of supplementing the natural regeneration of teak by artificial means. He complains that "Senior Officers" hold views on the subject which appear to him "contradictory, although dealing with fundamental points," and is also apparently indignant with the Forest Department in Burma for not having finally decided which is the best method to attain the desired end, ignoring the fact that the best method in one locality may prove a failure in another.

He informs us that the extraction of a large number of seed-bearing teak *must* (the italics are mine) result in a decrease of natural regeneration of teak. This is obviously incorrect. If

only mature trees are felled, and if these are judiciously selected, we are improving our forests by the removal of such trees and favouring the reproduction of the species. Of course if all teak seed-bearers were removed, reproduction of teak would cease, and the consequences would be serious both for the teak and for the officer responsible.

Mr. Walker's objections to teak taungya plantations are briefly the following:—

- (1) The growing stock has to be sacrificed.
- (2) They involve so much labour that other more useful work is neglected.
- (3) Artificial conditions *unsuited to teak* are created "proved by the fact that without weeding no teak survive."
- (4) They form breeding grounds for *Hybloea puera* and centres of contagion.

To these objections the following replies may be worthy his consideration:—

- (1) If the growing stock were of sufficient value it would be extracted and sold. But on sites selected for teak taungyas the growing stock would not repay cost of extraction.
- (2) First it is necessary to prove that other work is more useful.

(3) This argument will not "hold good water." In virgin forests *natural* conditions unsuited to teak are to be met with everywhere. We see a young teak suppressed for 20 years until nature comes to the relief and the dominating trees die.

Does Mr. Walker consider that all methods of artificial regeneration are to be condemned if they require more than one initial operation? If we manure a potato field it may produce more weeds, but, if the increase in value of the potatoes exceeds the cost of manuring and weeding, is it not sound policy to manure the field?

(4) *Hybloea puera* is probably a serious pest in plantations themselves, but until proof to the contrary is forthcoming it is conceivable that they form "concentration camps" and not centres of contagion.

Such theorizing will not settle the question of teak taungya plantations.

In time it will be possible to collect sufficient data for calculating the percentage such plantations if properly managed yield on outlay, and if it is found that they do not pay, they will not be extended.

In discussing Wathon Plantations Mr. Walker, ignoring the fact that the soil on which kyathaungwa is found is peculiarly suited to teak, takes his brother officers to task for not having accumulated "data for a cut and dried scheme when the kyathaung flowers" based on experiments made when other bamboos flower. Is it safe to argue that, because myinwathon plantations in Prome have proved a failure, kyathaungwathon

plantations are likewise doomed to suffer a similar fate? It would be interesting to know whether in the Prome plantations the bamboos were felled and burnt before the seed ripened or after.

Mr. Walker sets up a dummy "official theory" that "natural regeneration of teak corresponds with the flowering of the bamboo," and proceeds to demolish it with considerable acumen. Most Forest Officers who have worked in teak forests in Burma know that suppressed teak of all ages is not infrequently found under the lofty shade of kyathaungwa, and even occasionally succeeds in piercing its canopy, and one can hardly walk a mile in Myinwa teak forest, in which the bamboo is approaching maturity, without finding scores of young teak under older bamboo.

Mr. Walker discusses the "theory" that suppressed teak under bamboo survives when the bamboo flowers and dies, and competes successfully with the young bamboo growth that springs up. He says "there are several objections to this theory and no methods based on it." His meaning is obscure. If he means that the "theory" is incorrect and that no teak survives, it seems doubtful whether many Forest Officers in Burma will agree with him. It would obviously be difficult to select areas for the establishment artificially of such advance growth, as although we know the flowering periods of many species of bamboos, we rarely can ascertain when they last flowered in any particular locality in Burma.

Mr. Walker describes what he considers to be the best method of supplementing natural regeneration of teak by artificial means at considerable length, and apparently would recommend its adoption in all bamboo forests (where teak is indigenous) regardless of the locality. His method may be described as dibbling assisted by improvement fellings. He does not claim to have invented the method, which he says dates from "the earliest times when forestry was first taken up in Burma;" but he complains that the method "has not yet been brought to a high pitch of perfection." It is difficult to see in what way Mr. Walker's theories, if reduced to practice, would differ from similar operations carried out for several years in Burma. The varied nature of the forests in which such operations are carried out makes it almost impossible to lay down rules except on the broadest lines. The usual method is to take advantage of all natural gaps for dibbling teak and to create others artificially by felling and lopping inferior species. Mr. Walker has probably superintended such operations while in the Prome and Tharrawaddy Divisions, and it would be interesting to know what were the results of his methods.

Finally, I would thank Mr. Walker for his interesting article, but might an admirer of his courage in publishing his views suggest that the value of his article would not be impaired if he omitted general statements suitable for text books for beginners, e.g., "Problems of light and shade as they affect tree-growth require careful observation. On a typical sample plot....." *ad nauseum*.

I cannot claim to be a "Forest Officer of experience," but if I have succeeded in setting Mr. Walker's mind at rest on one or two points, I feel I shall not have usurped your valuable space in vain.

BASSEIN :

15th May 1904.

L. C. DAVIS.

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### **The Afforestation of Great Britain.**

Mr. Stebbing's letter on the subject seems to me more forceful than illuminating. The subject is one I pretend to no intimate knowledge of, but take some interest in professionally and from hearing it recently so much discussed at Home.

The majority of the House of Commons are very practical men, and I believe among the land-owning class, which form the majority, a good deal of interest is taken on the subject. I fear that Mr. Keir-Hardie's proposals, however practical they may seem to Mr. Stebbing, hardly appealed to the commonsense of the House.

Re-afforestation is generally admitted to be an excellent policy, but there are important questions of ways and means which have to be considered before the policy can be adopted.

If you were to consult the proposer, the practicability of his scheme would be exemplified by an increase of the income tax to meet the cost of his proposal, which I think has less reference to the need of forests than to the need of the working man.

Personally I doubt very much whether afforestation would affect the problem of the unemployed. The garden of England may have charms for the London loafer in September, but "the long winter months" is quite another thing.

I know the country better than the town, and there is scarcely a place I know in it where labour is not to be had for the asking. The trouble is that nobody asks for it.

What Mr. Stebbing describes as the two great fallacies in Mr. Long's argument, seems to me to have some germs of sense.

No afforestation on a large scale ever has been attempted in Great Britain, and the fact that Great Britain has therefore been very foolish and will pay heavily for its folly does not dispose of the difficulties in the way.

It has also been the custom to leave remunerative works in Great Britain to private enterprise, and it will not relieve Mr. Long's difficulties to learn that in India this is not the case.

Retired Indian Forest Officers could doubtless bring much useful experience toward the solution of the question, but it is money more than experience that is wanted, and retired Indian Forest Officers are in that respect seldom a valuable asset.

On the whole, however, I agree with Mr. Stebbing that Mr. Long's answer goes deeper and is more serious than Mr. Keir-Hardie's question necessitated.

S. C.



### **A Method of Killing Padouk.**

Some of your readers might be able to confirm the following curious method of killing Padouk. I have not yet caught an offender or tried it experimentally :—

In this and the neighbouring districts there is a great demand for Padouk of from 2 to 3 feet girth to make naves, and I had always wondered how there were enough naturally dead trees of this girth to supply the demand, no licenses being issued for green trees. The other day I was informed that if a splinter of *Thitsi* (*Melanorhoea* sp.) was driven into the heart of a Padouk, the latter would lose its bark in a month or so and die, apparently naturally. As all the projecting parts of the splinter would be cut off, the cause of death would be almost unnoticeable. This method is said to be well known to all the traders, and if true, accounts for the number of dead trees.

My informant also told me that there was some recent method of killing teak, but this was not generally known, and he had not found out what it was. It would be a useful piece of information if any one could supply it.

SHWEDO :

19th May 1904.

H. CARTER.

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### ***Eugenia occidentalis*.**

The following should be added to the description of *Eugenia occidentalis* figured and described in the May number of the *Indian Forester* :—

“It was provisionally placed under *E. polypetala*, Wight, a tree from Chittagong and Burma, from which it differs by the lower petals and the absence of bracteoles at the base of the calyx-tube.”

QUILON :

25th May 1904.

T. F. BOURLILLON.

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## **III.—OFFICIAL PAPERS AND INTELLIGENCE.**

### **Provision for the Employment of Forest Officers on Foreign Service.**

In the reorganization scheme of 1891 three appointments were included in the cadre of the Imperial Forest Service to provide for the deputation of officers on foreign service, and in 1901 two additional cadre appointments were sanctioned. Of late, the demands on the Forest staff for foreign service have increased, and, on the recommendation of the Governor-General in Council, four additional cadre appointments, thus raising the number temporarily to nine in all, have now been sanctioned by His Majesty's Secretary of State for a period of five years only, from the 4th April 1904, before the end of which period a further report is to be submitted. The additions will be made in the

lowest grade; and should the full number of officers allowed for foreign service not be so employed, the officers in excess will be shown as supernumeraries. When deputations are made the officers actually deputed will, as heretofore, be seconded on their own provincial lists, and the supernumeraries will be absorbed in the course of the provisionally substantive promotions. Arrangements have been made for the recruitment of two candidates in each of the years 1904 and 1905, in addition to the ordinary number of eight recruits.

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#### IV.—REVIEWS.

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##### **Vol. II.—Schlich's Manual of Forestry, 3rd Edition.**

A third edition of Vol. II of Dr. Schlich's Manual of Sylviculture has come out. This is the important part of the Manual which deals with Sylviculture proper. The present edition differs from the previous issue in that 63 pages have been added, the addition consisting chiefly of a new Part I called "The Foundations of Sylviculture." Chapter I deals amply but succinctly with atmosphere, climate and soils, with their relation to forest growth, so far as present knowledge goes. People are often very vague on these fundamental points, and no doubt this chapter will be often of great use to many. Chapter II describes the development of forest trees. It touches, among other things, upon height and volume growth, and reminds us that "the most favourable density of the crop can only be ascertained by accurate statistics." This is a direction, we think, in which a very great deal remains to be learnt, and by the nature of the case enormous patience is required. Perhaps we ought in India to lose no time in setting apart experimental areas of the most valuable species, treating each with different degrees of thinning, and thinnings made at different ages, even quite early ages. It has generally been supposed that young crops should not be touched; but has this been really thoroughly proved? We have seen one beech forest in France where the first "cleaning" only took place after 37 years, which seems very late. For such experiments we need a Research Bureau; no individuals can undertake them properly. Under "Reproductive Power" in this chapter is mention of root-suckers. Probably because in Europe it is principally inferior species which reproduce themselves in this way not much is given on the subject, but in India, we think, the subject has more importance, in as much as several very valuable species (e.g., *Dalbergia sisso*) are well capable of reproducing themselves from root-suckers. It may be that the longevity of trees grown from root-suckers is relatively superior to that of trees from stools, because of the more thorough dissociation from the parent.

In Chapter III we have pure and mixed woods contrasted, and much valuable instruction in this connection. Here, too, are descriptions of the mixtures of various European species, which will be of great use to European, and indirectly to Indian, Foresters also. In Chapter IV is a brief description of the different methods of treatment, which we think very important. In the second edition the great systems did not perhaps stand out very markedly, and it seems well that they should do so, since they are what all Sylviculture leads up to. The introduction of the name "uniform," by the way, to represent the French "*Mode des Eclaircies*" is, we think useful; it is rather difficult to work with the long term "Shelter wood compartment system." Moreover, "uniform" is the term in use in India, to which nearly all the author's pupils come. For the expression "crowded woods" may we suggest "close grown woods;" the former is liable perhaps to a slightly different construction. It seems to imply overcrowded, yet that is generally not meant.

The following sentence from p. 92 is a sign of the times: "As regards production the system of clear cutting compares favourably with other high forest systems. . . . The quality of the timber is also of a very high class if the thinnings have been judiciously carried out." This and the fact that in Europe natural regeneration is by no means always safe seem to be leading European Foresters more and more to artificial reproduction. This will no doubt be painful to many of the old followers of the "*régénération naturelle*," but facts are facts. We have seen, as long ago as 1889, a coupe of spruce clean felled and replanted with only 5 per cent of failures. It is also the case that in the Himalayan deodar selection forests artificial regeneration is necessary, by reason of the appalling growth of shrubs that now springs up. But at any rate in the plains of India it is usually the case that we can only rely on a natural re-growth.

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### Sylviculture, by Albert Fron.

M. Fron's "Sylviculture" is one of a series of works dealing directly or indirectly with agriculture, and his object is to interest agriculturists and private proprietors of woods in forest economy. The object is highly commendable, if rather utopian; still here and there his words may strike home. The book appears to be just a manual of the kind Foresters are accustomed to, and does not seem specially adapted to the minds of agriculturists or private proprietors unless it be by means of the plates, which give ocular demonstration of properly worked forests in different periods and under different methods. We think writers of Sylviculture manuals might do much more in this direction, and M. Fron has set a useful example.

The plates might have been clearer with advantage, though it is always difficult to present forest pictures as distinctly as is desirable for educational purposes.

The book seems well up to date, and is written in an interesting way. We hope it will be successful.

### **Annual Report on Forest Administration in Assam 1902-1903.**

The total area classed as State forests at the close of the year was 22,078 square miles, of which 3,778 constitute Reserved Forests, the remaining 18,300 square miles consisting of unreserved jungle and waste.

Seventy square miles of forest were added to the Reserves during the year, 4 square miles in the Garo Hills, and 66 square miles in the Goalpara district, forming the Kachugaon Reserve.

Fifty-seven square miles were undergoing settlement at the close of the year.

The Goalpara division is the only one in which the forests are worked under working plans, and the working plan for the sal forests of this division terminated at the close of the year. A re-valuation of the growing stock has been made, and the expired plan has been revised with a view to its extension for the next 15 years.

The total area of forest specially protected from fire was just under 1,000 square miles, and the cost of fire protection was Rs. 7-8-0 per square mile. Only two square miles were burnt. Partial protection, at a cost of Rs. 2-2-4 per square mile successfully protected, was also afforded to 196 square miles of the Bijni Reserve, of which 17 square miles were burnt.

Rubber collected from the Kulsi and Chardnar plantations during the previous year was sold for Rs. 18,200, or slightly over two rupees per pound. Rubber-tapping in the Chardnar plantation yielded 6,462 lbs., or an average of 21.7 lbs. per acre, and 1.4 lbs. per tree.

Excluding the rubber from these plantations, the total outturn of home and foreign rubber amounted to 1,307 maunds.

The total outturn of timber and fuel for the year was 12,725,852 cubic feet, of which 41,898 cubic feet were extracted by means of the Goalpara tramway, which remains  $4\frac{1}{2}$  miles in length, by which a saving in transport, estimated at Rs. 1,900, was effected, equal to a net profit of 5 per cent on the capital outlay.

The financial results of the year's working show a surplus of Rs. 2,44,765, the average annual surplus being slightly over  $1\frac{1}{2}$  lakhs. The receipts were over a lakh in excess of those of the previous year, partly due to an advance of Rs. 42,500 paid by the Eastern Bengal State Railway for sleepers, and to the realisation during the year of the price of rubber collected in the previous year.

Lac yielded Rs. 12,000 in the Garo Hills division, and nearly Rs. 17,000 was made from canes.

## V.—SHIKAR AND TRAVEL

**A Digression and an Incident.**

The *Indian Forester* includes "Shikar" among the topics to which its pages are devoted, and a stranger finding a volume in his hands for the first time would surely be surprised not to find a fair share of each month's issue claimed by what he would rightly suppose to be the Forest Officer's principal recreation. Yet it is but seldom that a "shikar" contribution finds its way into the *Forester*. This is presumably due to a general recognition of the fact that "shikar," although the best and most absorbing of sports, is apt to make the very dulllest reading that can be found; unless indeed the events described are quite out of the ordinary run or the writer has the special knowledge of his subject and that gift of the few which have made a few "shikar" books so fascinating. Too often the "shikari" who rushes into print is a novice in the first glory of his first tiger, a hopeless egotist or one paid by the column to fill up the pages of the "Field," whose thrilling descriptions are only surpassed by accounts of football matches played by unknown players at unknown places. How well do we know those closely printed lines describing for the 'n<sup>th</sup>' time the camp, the shikaris, the 'khabar' (generally spelt kubher), the line of elephants, the stops, the tiffin, the moving grass, finally the death or escape of the mighty 'stripes' himself or the more wily 'spots.' Occasionally the literary sportsman, to give his expeditions a greater air of the real thing, will entertain us with a long account of a blank day.

Thus if the meagreness of the "*Forester*" as regards "shikar" is sometimes a matter for regret, it is also something to be thankful for, and it is therefore with considerable diffidence that I narrate an incident of recent occurrence, in the hope that its comic side may be its excuse, and that it will encourage all sitters in machans to sit on, however hopeless the outlook.

McEluire and I were in camp together. I must not omit to state that McEluire is one of those of whom we stand in awe vulgarly known as a "boss." We were busily engaged one morning after breakfast in the pursuit of the flying docket, when a shikari, not in our employ, came in to announce that two cows had been killed from the same herd about seven miles away. His informant was a simple-minded herdsman whom we found on the spot on our arrival and who conducted us at once, a short distance among dense undergrowth, to a very promising looking kill, evidently that of a tiger. It had been recently killed, a small portion had been eaten, and it was excellently hidden. There, in a good position, at about 3-30 P.M., McEluire was established. The shikari had come away too quickly to fully investigate the story of the simple-minded one, and for our next move we were entirely dependent on the latter. On being asked to disclose the second

kill he showed a suspicious vagueness, but urged on by the others he set forth to find it. We wandered along for a considerable distance, getting vaguer and vaguer, until at last it became evident that our guide was going nowhere in particular, and we came to a stop. The "shikaris" took the herdsman outside the forest so that he might take a general view of the situation and endeavour to recollect something. After a prolonged interval they returned with the statement that they had found the kill, and again we proceeded a long way in what I perceived must be more or less the direction in which we had come. I was on the point of giving up for fear of spoiling sport, when we came on the kill, a thing of loose skin and bones, eyed greedily by vultures from surrounding trees. Having come so far I determined to pass the time till dark by sitting over this untempting morsel (I speak from the tiger's point of view too), so a machan was quickly tied up, and by 4-45 I was sitting quietly watching the vultures and wishing it was time to go. So I sat for some three-quarters of an hour, when a deafening report seemed to come from just behind my ear. I jumped as if the bullet had hit me, and for a second wondered if my rifle had gone off. Looking round I saw a small puff of smoke hovering over a tree not 20 yards away! Soon I heard the movements of a heavy animal, then two more shots, and then a shout from McEluire that the tiger was dead. McEluire had of course seen and heard my return and installation, and his thoughts were bitter, but he wisely elected to keep quiet and see the matter through, though hope was all but dead.

Whether the vulture-eaten cow was really the second kill or an older one, how it was that we did not see the vultures on our first arrival, and whether there really ever was a second kill of the same date as the first, are points which were never settled.

SOHELWA.

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### The Long Round to England.

The following corrections should be made in the article "The Long Round to England" which appeared in the April number of the *Indian Forester* :—

Pages, 176, 177, 178, 179—for 'Kinshin' read 'Kinshitu';  
 page 179—for 'Telkowa acuminata' read 'Zelkowa acuminata';  
 page 180—for 'Daimys' read 'Daimyos'.—HON. ED.

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## VI.—EXTRACTS, NOTES AND QUERIES.

**Forestry as an Industry.**

On Monday, before the members of the Farmers' Club, at Whitehall Court, London, Mr. A. C. Forbes, of Longleat Nurseries, read a paper on "British Forestry as a Rural Industry." Mr. Forbes said the general idea was that the improvement of existing woods and their extension on poor land not needed for agriculture were desirable steps to be taken by the landowners of the country, and he thought the fostering of this idea was justified. Reviewing the existing condition of British forestry, he said that the condition of plantations under fifty years of age was comparatively good, but most of the older plantations had been thinned out to excess during youth or middle age, and then allowed to stand until partly decayed, the timber in almost all of them being coarse and largely consisting of species for which there was no regular demand. As a source of commercial timber, their value lay more in their landscape effect and the shelter they afforded for game and adjoining agricultural land. The home timber trade was slowly but surely degenerating into a kind of jobbing business, dealing with a commodity which already had a poor reputation, and which only came on the market at uncertain periods and in uncertain quantities. He felt sure that the adequate development of forestry in rural districts would eventually assist in checking the rural exodus now in progress and assist the agricultural interest by increasing the number of men available at busy times. Small as the area of land under wood in this country was, he asserted that it was not made the most of as regards timber production, it did not yield an adequate income to the owners, it did not enable the home timber trade to be carried on as a commercial success, and it did not afford employment to more than half the number of men that it should. Summing up his contentions, Mr. Forbes said that timber growing was likely to pay in this country under certain conditions. It would pay to grow ash and larch, and probably Douglas fir on suitable ground and on a small scale. It would pay to grow coniferous timber generally on the poorer soils and less favourable situations, but only on a larger scale than is now the custom. On soils and situations of the latter class, forestry must be developed to a greater extent than on the former if it was to pay, and whatever plantations were formed must occupy fairly large areas, so that the quantity produced would be sufficient to feed industries, such as coal-mining and railways, which consume large quantities of cheap timber. The planting of waste or poor agricultural land gave every promise of turning out a commercial success if carried out on proper lines. We must plant a few of the most suitable species only, instead of a great number of unsuitable or doubtful ones, and grow bulk instead of samples;

we must plant on large compact areas instead of on small detached patches of a few acres; and we must allow the timber to stand until it was mature on the one hand, and prevent it from standing until it was half rotten on the other. He believed that if private owners were to co-operate amongst themselves and then secure the assistance of the Government, the same classes of soils and situations on adjoining estates or on our hill ranges might be planted with the same species and a more regular and abundant supply of timber secured, to the advantage of both grower and consumer. But the first step to be taken was, in his opinion, the improvement and proper utilisation of existing woodland, a great deal of which at the present time was practically waste land. If we could get the British public to realise the fact that economic forestry was a national rather than a private question, that apathy which now prevailed in the matter would disappear, and it might be possible to devise means by which the burden of woodland improvement, which now fell entirely upon the shoulders of the private estate owners, might be more equally distributed with more productive and satisfactory results.—*Timber Trades Journal*.

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**IRISH FORESTRY SOCIETY.**—The second annual meeting of the Irish Forestry Society was held in the Mansion House, Dublin, on Thursday last week. Mr. O. H. Braddell, Chairman of the Executive Committee, presided.

The Chairman, in opening the meeting, said the Society had been endeavouring to bring before the people of Ireland the great benefits that would accrue from reafforestation. In order to excite and stimulate, as far as possible, the interest in this wide-reaching subject the Society had offered prizes of five guineas each to the four provinces of Ireland for the best essay on "The present conditions and the future prospects of forestry in Ireland." These prizes had been won by the following:—Ulster, Mr. J. C. Johnston; Leinster, Mr. William Dick; Connaught, Mr. Hynes; and for Munster the judges recommended—and the committee decided to adopt their recommendation—that the prize be divided between Mr. Archbold E. Moran, and Mr. R. H. Keane, whose essays they considered to be of equal merit.

The Chairman introduced Mr. Augustine Henry, who gave a very interesting lecture on the Forestry of the Continent, with most lucid details of the manner in which the oak forests of France are looked after and nurtured by the State, with the result that what were formerly dense swamps and barren districts have been converted into beautiful forests, giving employment to a large number of inhabitants, as well as adding materially to the wealth and beauty of the country. The series of slides which illustrated the lecture were of the greatest assistance in elucidating the various points which the lecturer desired to bring before his audience.



On the motion of Mr. Scott Kerr, seconded by Mr. Dick, the annual report and statement of accounts were adopted.

The report, among other matters, referred with regret to the loss which they had sustained through the death of Dr. Cooper, who was the founder and president of the society.

Alderman Cole moved the election of Lord Castletown as president in room of the late Dr. Cooper, and the re-election of the members of the Executive Committee and officers.

The motion was adopted, and votes of thanks having been passed to the Chairman for presiding and to Mr. Henry for his interesting lecture, the proceedings terminated.

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EDUCATION IN FORESTRY IN THE NORTH OF ENGLAND.—The Durham College of Science propose to develop a satisfactory scheme of education in forestry for the four counties of Northumberland, Durham, Cumberland, and Westmoreland. This is to include the appointment of an expert in forestry, whose first duty will be to give lectures to the agricultural students of the College, many of whom intend to adopt the profession either of land agent or of teacher of agricultural science. He will also conduct short courses of lectures for young foresters at suitable centres, and conduct the members of the class to adjacent woods for demonstration purposes. The scheme embraces quite a number of other matters, such as instruction in the planting, cultivation, and layering of fences, the construction of other fences and gates, the treatment and preservation of timber, etc., as well as the provision of expert advice for owners of woodlands. — *Timber Trades Journal*.

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A SUCCESSFUL SHOOTING TRIP.—We learn that the Government of Mysore have given permission to Mr. G. E. Ricketts, Deputy Conservator of Forests, to accept a cheque for £100, presented to him by Lord Manners on the occasion of his visit to Mysore. It will be remembered that Mr. Ricketts was instrumental in organising a most successful shoot in the Mysore hills for his Lordship.

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RECRUITMENT OF FOREST OFFICERS FOR INDIA.—We now learn that the Committee appointed by the Secretary of State for India to report on the closing of Coopers Hill College recommended that probationers for the Indian Forest Service should be trained at Cambridge until such time as the founding of Forest Schools in Great Britain will justify the offering of appointments in the Indian Forest Service to holders of diplomas in Forestry from such schools. We do not advocate the training of future recruits for India at Cambridge, and we most strongly deprecate the idea of recruiting the Forest Service in India from among those who have an education in Forestry as applied to British requirements. Apart from other objections such an

education cannot meet the special requirements of service in India, and this method of recruitment would involve a further training in India before the recruits could be made use of by the department.

The Committee remarked that the only advantage the candidates for the Forest Service derived from being trained along with candidates for the Public Works was that they learnt how to make roads and move heavy logs. Whether this last refers to the principle of the lever or to the internal economy of the domesticated elephant we cannot say, but we imagine instruction is still given at Coopers Hill in such subjects as surveying, building materials, construction of buildings, estimating, map and plan drawing, all subjects a knowledge of which will not easily be acquired at Cambridge, and without such knowledge a Forest Officer in India will frequently find himself in difficulty.

## VII.—TIMBER AND PRODUCE TRADE.

### Churchill and Sim's Wood Circular.

3rd June 1904.

**EAST INDIA TEAK.**—The deliveries during May amount only to 480 loads as against 1,113 loads in May, 1903. For the first five months of the current year they are 3,814 loads as compared with 4,787 loads for the same period of 1903. There is no change to report in prices, but some small clearances have been effected in London during the month at rates which were more in favour of buyers than of sellers.

**ROSEWOOD—EAST INDIA.**—There is a good demand for really prime wood, but small or poor logs do not move at all readily.

**SATINWOOD—EAST INDIA.**—Sales are difficult to effect, as the demand is quiet and much of the stock limited above the market.

**EBONY—EAST INDIA.**—The demand is dull and stocks sufficient.

### PRICE CURRENT.

Indian teak, logs,	per load	...	...	£9-15s. to £18
„ „ planks,	„	...	...	£12-5s. to £20
Rosewood,	per ton	...	...	£6 to £12
Satinwood	per s. ft.	...	...	7d. to 18d.
Ebony,	per ton	...	...	£5 to £10

### Denny, Mott and Dickson, Limited.

#### WOOD MARKET REPORT.

London, 1st June 1904.

**TEAK.**—The landings in the docks in London during May consisted of 564 loads of logs and 543 loads of planks and scantlings, or a total of 1,107 loads, as against 1,192 loads for the corresponding month of last year. The deliveries into consumption

were 200 loads of logs and 183 loads of planks and scantlings—together 383 loads, as against 1,025 loads for May, 1903.

The Dock stocks at date analyse as follows:—

	6,915 loads of logs, as against 5,122 loads at the same date last year				
4,212	„ planks	3,008	„	„	„
—	„ blocks	—	„	„	„
Total	11,127 loads	8,130 loads	„	„	„

As indicated by the above figures, there has been little or no consumption of a wholesale character during May. Whilst business continues to be of so retail a nature, the bulk of the arrivals will have to be stored; and exceedingly moderate as the year's shipments continue to be, landed stocks will tend to increase, although a renewal of anything approaching a normal enquiry for shipbuilding and rolling stock purposes would once again make supplies altogether inadequate. Meantime, shippers see no reason to lower their f. o. b prices, and importers on this side have no inducement to make forward contracts for stock at the present high level of cost.

Notwithstanding the drop in the rates for money which has ameliorated the financial strain, general business has been very stagnant during May; and the fact of there being more money on the market arises from the tendency to husband the proceeds of stocks realized, rather than to employ such proceeds in fresh purchases. The breaking of the month by the short Whitsun holiday is altogether inadequate to account for the great stagnation in demand for fresh constructive work.

### Market Rates for Products.

*Tropical Agriculturist, June 1st, 1904.*

Cardamoms	...	... per lb.	1s. 6d. to 1s. 7d.
Croton seeds	...	... „ cwt.	20s. to 22s. 6d.
Cutch	...	... „ „	22s. 6d. to 30s.
Gum Arabic	...	... „ „	15s. to 20s.
„ Kino	...	... „ lb.	3½d. to 5d.
India-rubber, Assam	...	... „ cwt.	2s. 3d. to 3s. 7½d.
„ Burma...	...	... „ „	2s. to 3s. 7d.
Myrabolans, Madras	...	... „ „	5s. to 6s. nom.
„ Bombay	...	... „ „	4s. to 7s. 6d.
„ Jubbulpore	...	... „ „	4s. to 6s. 3d.
„ Bengal	...	... „ „	3s. 6d. to 5s. nom.
Nux Vomica, Cochin...	...	... „ „	8s. to 10s. 6d.
„ Bengal...	...	... „ „	6s. 6d. to 8s. 6d.
Oil, Lemon grass	...	... „ lb.	8d.
Orchella weed	...	... „ cwt.	10s. to 12s. 6d.
Seedlac	...	... „ „	190s. to 210s.
Tamarinds, Calcutta...	...	... „ „	7s. to 9s.
„ Madras	...	... „ „	4s. 6d. to 6s.

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## **Proportionate Fellings in Sal Forests.**

### **A THEORY, SOME SUGGESTIONS, AND A METHOD.**

I. WE have followed the series of articles which appeared some time ago in the "Indian Forester" with interest, and are now encouraged to add our quota, not with any idea that we are offering the solution to the problem by any means, but in the hope that our suggestions, such as they are, may serve as a means to that end, and in the belief that our theory is at least arguable, though doubtless many kind critics will speedily show it to be as untenable as its predecessors.

Taking certain Indian working plans as our starting-point, it seems to us that in many cases their great defect lies in the fact that they have an unstable basis, and that too often an elaborate system is drawn up which rests on the very shallowest foundations, super-imposed on the most hyperthetical of grounds.

In other words, they start to deal with an abnormal forest almost invariably, and end almost as invariably by leaving it only a few degrees, if at all, less abnormal at the end of a period or a rotation than it was before.

This is due to several errors, the initial one, we would suggest, being often the want of a definite objective, and the failure to institute any real comparison between the actual and normal growing stocks of a forest.

It requires little demonstration to show that in ninety-nine cases out of a hundred a work commenced with no definite aim is bound to be a failure. This, we contend, is their position.

The remedy, theoretically, is simple. Our one aim to be kept always in view should be the gradual creation of a normal, in place of the present abnormal, growing-stock. That no working plan can theoretically be sound which fails to institute a comparison of some kind between the actual and normal growing-stocks of a forest, is we take it an indisputable axiom.

This comparison should form the basis of everything, and it is on it alone that the future of the forest rests. We all know and recognise the forester's three great maxims or ideals, the creation of a normal growing-stock, a sustained annual final yield, and the utilization of the annual increment; but too often,

while our intention is to remember them, we forget or ignore them. The *first* represents the desirable but unattainable, being of necessity idealistic, and we must content ourselves with a good imitation of the real thing, preferably as "made in Germany."

The *second* is attainable, but not always desirable, while the *third* is both desirable and attainable.

We say the second is attainable but not always advisable, since we shall often be called upon to decide the respective claims of silviculture and finance in this respect, and it is as well to approach such questions in a broad-minded way, when we may reasonably hope to effect an honourable compromise if nothing more.

With regard to the third we should not forget that "the increment alone renders the growing-stock an active capital," and while removal of too much is worse than removal of too little, both are heinous crimes.

Even here there can be no hard and fast rule. Circumstance must be our master; and while on one hand we may be called upon to cut over woods showing a poor increment, so as to replace them as soon as possible with more vigorous growth, on the other we must beware of cutting over vigorous woods prematurely, nor must we retard cutting incompletely stocked woods for sentimental reasons.

This brings us to the question of Normal Growing-stock, and how best to attain to it or thereabouts is the problem we set before ourselves in this article.

Now with regard to our first object of management, the creation of a normal growing-stock, we would draw attention to the fact that the latter, while valuable as a means to judge the capacity of a forest to yield a fixed return for a certain period of time, is not absolutely essential to know, or at any rate not more than approximately. Indeed, it is not even desirable to know it, if we intend to take it too seriously and as anything except a useful theoretical guide.

For, provided we can maintain the normal increment or render the abnormal increment normal, and establish a normal series of girth-gradations, the growing-stock must automatically fall into line with other conditions and itself become normal.

Hence our direct affair is with abnormal increments and girth-gradations.

Indeed, were we blindly to follow the dictates of a numerical or volumetric normal growing-stock, we might soon find ourselves at an *impasse*, as it is possible, to take an extreme case, to have the normal growing-stock on the ground as a whole as far as volume or numbers are concerned, and still not have the proper proportion of mature trees—indeed, there need not be a single mature tree on the ground the deficit in which in any class is made up for and compensated by excess in the lower classes.

Hence let us not put too great a trust in "normal growing-stocks."

But that it is a useful guide is undeniable.

Then, with regard to our second object of management (a sustained annual yield): At present what is the case? Most working plans successfully burke the question by practically saying "Sufficient unto the day is the evil thereof." They arrange for a more or less sustained annual yield for the first period, of perhaps twenty years, and rest content.

Perhaps they go so far as to hope that at the end of the period the growing-stock will have generally improved, or say in a non-committal way they "expect so many trees of each of the upper classes will be on the ground." At best they successfully prevent over-exploitation and in their eagerness to do what is right forget the opposite but none the less insidious evil, that of under-cutting.

Over-cutting has been long a forestry shibboleth, and with reason enough, since ever since the Forest Department was started almost, we have been fighting to prevent it and to re-establish forests partially or wholly ruined by too heavy fellings in the past.

Many ingenious checks to over-exploitation have been devised, such as to fix the area of the annual coupe or the maximum number of trees to be felled. But these were not enough, and we were compelled to fix a certain minimum girth, below which no tree could be cut, when, by dividing the total number of first-class trees by the number of years required to replace them, we obtained the maximum number of trees it was permissible to fell annually.

Theoretically, again, this is correct, but in practice it would be likely to result in an infringement of our second object of management, and would mean a fluctuating yield.

To avoid this we may resort to the artifice of sub-periodic blocks, and so arrange these as to give us as nearly as possible an equalised annual or sub-periodic final yield. If we wish to go a step farther we may try and combine this with more or less annual sub-periodic coupes, but this is merely a matter for convenience while the former is necessary.

If an area check is adopted, it should give minimum and maximum areas of annual coupes to allow of elasticity in felling, within sub-periodic limits, to meet possible fluctuations of the market. This is where our working plans too often fail. With commendable dexterity and foresight, and often by means of weird formulæ or figures, they successfully prevent any fear of over-cutting and consider, when they have taken out all first class exploitable trees within the period, whether more or less than the normal number, they have done all that is required of them.

But what about the proportion or percentage of trees in each class which never for various reasons attain to the next higher class, the forest drones?

Again, what about possible surplus growing-stock? Unless we take steps to remove these superfluities of the forest, which are likely, too, to prove a remarkably powerful asset at times, we are under-cutting.

There is, too, the converse, where we have a deficient growing-stock and annual increment.

Here proper nursing is required to restore the normal growth. Hence we see at once that some comparison between normal and actual growing-stocks becomes absolutely essential; and at present so far as we know no such comparison exists.

But our present concern is with the superfluous quantities. What are they doing at present? Simply decaying or occupying space that might be utilised better to give much required light and crown-freedom to others, to relieve over-congested parts, and to make room for more promising individuals. By not utilising them we are tying up our capital, losing legitimate interest.

But how are we to know what trees to remove? We cannot hope to point out each individual tree as certain never to attain to the next highest class. A tree which is dominated now by another when the latter comes out may possibly shoot up to take its place. We will for the moment leave the attempt at answering this to take it up in its proper order later on.

There is no attempt made to calculate the normal growing-stock and compare it with the real growing-stock, and to carry out fellings in such a way as will result not fortuitously but designedly at the end of the period or rotation in the growing-stock having been perceptibly brought nearer to the normal growing-stock by a series of carefully promoted fellings, which must eventually lead the abnormal increment over to the normal, and enable us to attain to the full utilisation of any surplus stock, or at least of the annual increment provided only both growing-stock and increment are not "below par," when "improvement thinnings" rather than selection fellings would best meet the case.

The very natural result of this policy of "laissez-faire" has sometimes been that not little has been left standing except the lower classes of trees in many of the sal forests.

True, these cases apparently have been the result more of injudicious "improvement fellings" rather than of "selection fellings," and with area and no girth-check, but while there the mistake was over-cutting, elsewhere it has been under-cutting, a lesser evil perhaps, but none the less an evil for all that. Small wonder either that such should have been the case, when unscrupulous people tried to obtain "sustained yields" from "improvement fellings" in partly ruined forests.

But our quarrel is with selection, not improvement fellings, and our concern with normal growing-stocks and proportionate fellings.

Having explained the general principles on which we would base our working-plan prescriptions, we will now proceed to enunciate our theory and to demonstrate what appears to us to be an arguable and possible method of carrying out proportionate fellings, by trying to show that, if there are no actual data available as to what the proportions of the girth classes in a "truly normal" forest should be, there is at least material to hand of a sort, only waiting to be applied.

MORE LIGHT.

(To be continued.)

### Notes on Sandal.

(Concluded from page 362.)

#### VII.—ARTIFICIAL REPRODUCTION.

45. THE question whether the existing natural sandal areas can be relied upon to produce all the sandalwood that is consumed annually, or whether it should be supplemented by artificial plantations to meet the demand, has been dealt with at much length by more experienced hands, but so far as I can gather a definite and precise answer has yet to be given. I do not propose to enter into that difficult question here, but shall merely remark in passing that provided natural reproduction is encouraged and fostered in a proper manner, there will be little necessity to resort to costly artificial plantations.

46. So far as our experience of the existing sandal plantations in Mysore, Coorg and the Madras Presidency goes, I believe the general consensus of opinion is that they have proved a failure, or at any rate that they are not a success, notwithstanding that a few plantations in the neighbourhood of Bangalore are said to be otherwise. The plantations in Coorg and Mysore seem to have been very promising up to the age of 10 or 12 years, but to have shown signs of failure after that age. In most cases I believe the sites selected were bare open lands. This was a serious mistake, committed through ignorance of the life-history of the sandal. When young the sandal was probably content to live on the nourishment furnished by the roots of grasses and other herbaceous growth that covered up the open lands. As it grew older the scanty nourishment its pigmy host could furnish was quite insufficient for its growth and development. The supply of plant food was further diminished by the weeding out of all herbaceous and shrubby growth that came up in some of the plantations, and this proved a greater mistake than the initial one of selecting bare localities, and to it I attribute the failure of plantations after the age of 10 or 12 years.

47. In this connection two questions arise (1) can sandal be grown *successfully* and *profitably* in plantations? and (2) if so, under what condition? As regards the first we may answer it in the affirmative without hesitation. Even away from



its natural surroundings I have seen sandal growing vigorously and producing good scented wood in the hedges of gardens, in the compounds of bungalows, and in the neighbourhood of cultivation. I would mention that I have noticed this in many places, and among others, in the Salem Town at an elevation of 950 feet, Kullavai in Uttankarai Taluk and Jagadevi and Bargar in Krishnagiri Taluk of the Salem District, the last three being at an altitude of about 1,300 feet only. There is therefore no reason to doubt its possible successful growth in plantations formed within its own habitat, provided of course all the favourable conditions are present. What those conditions are, the reader will doubtless gather for himself from my previous remarks regarding "natural reproduction."

48. Although I have had no practical experience of forming sandal plantations, yet I have ventured to submit for the consideration of Indian Foresters some ideas which have suggested themselves to me on the subject. They may be arranged under the following three main heads: (1) choice of locality; (2) method of stocking; and (3) after-treatment.

#### (1) *Choice of Locality.*

49. Unless a plantation of sandal is undertaken on a small scale purely for experimental purposes, the choice of locality for its formation and growth on commercial principles must, of course, be limited for obvious reasons to the natural *habitat* of the species. In selecting the site for a plantation, the following factors should be considered:—

(a) Condition of the site wooded or bare; (b) drainage; (c) aspect; (d) altitude; (e) soil.

As regards (a), a site wooded with indigenous species of trees and shrubs, especially those in whose society the sandal is, by experience and observation, found to produce the best quality and the largest quantity of scented wood should be preferred to bare land. Although we have as yet no positive proof that the associates of sandal influence the development of scented wood in it and that some of them do so in a much greater degree than others, yet I believe strongly that such is the case. What appears in paragraph 2 of Mr. A. W. Lushington's article on page 113 of the "Indian Forester" of March 1903 and in paragraph 14 *supra* of this article, may be taken as sufficient, though admittedly too slight and inconclusive to be classed as scientific evidence to justify my belief, which is further based on my general observations of sandal trees in different parts of the Salem District. The scientific determination of the important and interesting point in the life-history of sandal is more the work of specialists with the requisite knowledge and means of conducting investigation than of practical foresters. The latter can, however, collect useful information in the field by observations as to what species of plants influence the development of scented wood in

sandal in greater or lesser degree than others, and it would be well worth the trouble of all Forest Officers to do this who have sandal forests in their charge.

Now to return to the subject of the condition of site, my reasons for selecting wooded in preference to bare land will be found in the remarks on "Natural Reproduction." When such land is selected, the growth on it must be felled, leaving here and there a few trees and shrubs, and the land then ploughed up. Where ploughing is not practicable the soil must be worked up by digging with the hand. If a wooded site is not available and bare land has to be taken up, it should first be clothed up with vegetation before planting or sowing is undertaken; this can be done quickly by first ploughing the land and sowing seeds of indigenous species of trees and shrubs. When these auxiliary species have come up well, then the land may be sown or planted with sandal. The ploughing of the land is required only where the soil is hard and dry, but where it is naturally friable and loose this operation may be dispensed with.

(b) *Drainage*.—Sandal does not occur in nature in water-logged localities, or at any rate it does not thrive on them. It wants well drained soils, and therefore any site selected for plantation must have good natural drainage. A gently sloping land is preferable to a flat level one.

(c) *Aspect*.—As far as my observation goes, the influence of aspect on sandal is much greater than Mr. P. M. Lushington is inclined to believe, *vide* the last para. on page 9 of his "Notes on the Sandal Tree in Southern India." The eastern and southern aspects are distinctly more unfavourable than other aspects unless they are sheltered by higher ranges or ridges of hills. Western and northern aspects appear to be more favourable, and where possible I should select a locality with one of these two aspects or any variation of either. It is true that sandal occurs naturally on all aspects, but on eastern and southern ones it is less promising, especially at lower elevations. I have seen very good natural growth of young sandal in the inner Javadi Reserve of the Salem District on a steep eastern slope at an altitude of 3,600 feet, but here the hill-side is very well wooded and the leaf-canopy is almost complete, so much so that the direct rays of the sun rarely reach the ground, while there is plenty of infiltrated light. This is exceptional rather than general, as I have hardly seen a like instance elsewhere on the Javadis.

(d) *Altitude*.—Since the choice of locality is limited to the natural habitat of sandal, it is perhaps superfluous to deal with altitude here. Nevertheless, a few remarks seem to be called for as the range of elevation within which sandal is found to grow in the Salem District varies from 950' (Salem town) to 4,600' (Shevaroy hills) above sea level. These are doubtless extreme altitudinal limits within which sandal plantations may prove successful; but the normal limits within which the bulk of

natural sandal occurs varies from 2,000' to 3,700' on the Javadias, Yelagiris, Melagiris, and Javalagiris; I should certainly select a site between these limits approaching as much as possible to 3,000' and above rather than below it.

(e) *Soil.* - Sandal is rarely ever found in purely sandy, clayey or marly soils. It occurs in rich deep friable loams and also in very stony dry soils; its growth in the former is rapid and luxuriant, and trees attain considerable dimensions, whereas on the latter soils it is slow, stunted and the tree rarely attains more than 2½' girth. I have found the best growth of sandal on deep ferruginous red loams with a moderate admixture of stones. On such soils, trees of 3' to 5' girth are common. For a plantation, it is desirable to select such red loams. Trees grown on poor stony and dry soils are believed to yield more highly scented wood than those grown on rich deep soils. There appears to be some reason for this belief, but it is for further observation and study, as also the question whether by a judicious and careful selection of the associates for the sandal, the richness and development of the scented wood cannot be improved on deep rich soils. As observed by Mr. P. M. Lushington, trees grown on rich soils produce age for age above a certain limit a much larger quantity of scented wood than those on poor dry soils, and this is an important point to be remembered in selecting the soil for a plantation.

I have omitted to deal with the climatic conditions favourable to sandal, because the locality to be selected for a plantation being within the *habitat* of the species, its climatic requirements presumably exist there. Moreover, these conditions are fully dealt with in Mr. D. E. Hutchins' note on "Sandal" published in Vol. X of the "Indian Forester," and I have nothing more at present to add to his remarks.

#### (2) *Method of stocking.*

50. Under this head we may briefly consider (I) preparation of the ground; (II) composition of the crop; and (III) mode of stocking. In respect of (I) I have already said that where the soil is hard, it requires to be loosened by ploughing or digging. If it is loose and friable, it seems sufficient to merely scratch it up in small patches of, say, 6" square and 2" or 3" deep under or amidst clumps of coppice bushes or scrub. In my opinion it is unnecessary to dig costly pits of one yard cube, as was originally done in Mysore, nor need we dig pits of larger dimensions than 6' square, as above recommended. Apart from the costliness of pitting, there is the risk of preventing or retarding quick formation of root-connections between the sandal and its associates by sowing or planting in the centres of larger pits. Where bull planting is resorted to, which I would do only as a last resource, pitting will become necessary, and even then the pits should be just large enough to hold the balls of earth with which the

seedlings are transplanted. If *dibbling in* of seed is the mode of sowing adopted, no previous pitting or scratching in friable soils appears necessary, all that is required being a hole made with a pointed stick and the seed dropped therein.

### (II) *Composition of the crop.*

51. From what has been already stated under "*Root-parasitism*" and elsewhere in the course of these notes, it will be readily understood that the sandal is of all tree-species the most unsuitable to be grown as a pure crop. This was recognised so far back as 1884 by Mr. D. E. Hutchins, although he was then doubtful about the root-parasitism of Sandal and recommended a mixture of other species with it on other grounds, *vide* page 25 of his article on "Sandal" already referred to. Nevertheless in the earlier sandal plantations it was planted pure, and with what lamentable results we all know now. With our present knowledge of the life-history of the sandal the mistake could hardly be repeated. As to what species are the most suitable to be mixed with the sandal, we are not yet in a position to make a full and precise statement, investigation being incomplete. But we have already a long list of associates to which I may now add *Citrus aurantium*, *Clausena indica*, *Dalbergia paniculata*, *Derris scandens* and *Cocos nucifera*, with all of which it has been since found that sandal forms intimate root connections. Out of this long list I would select the *Albizzias*, *Acacias*, *Dalbergias*, *Ingas*, and *Pongamia* and climbing *Papilionaceous* plants of the *Leguminosæ*; the *Zispyhus* and *Sacutia* of *Rhamnæ*; *Premnas*, *Vitex* and probably *Tectona* of *Verbenacæ*; the *Anonas*, *Uvarias* and *Polyalthias* of *Anonacæ*; *Litseas* and *Alseodaphne* of *Lauracæ*; *Citrus*, *Clausenas*, *Limorias*, *Atlantias* and other genera of *Rutacæ*; *Melias* and *Cipadessa* of *Meliacæ*; *Cudrinas*, *Strebilus*, and *Holopteoba* of *Urticacæ*; *Wrightias* and *Carissas* of *Apocynacæ*; *Thespesia* of *Malvacæ*; *Date* and *Coconut* palms of *Palmæ*, and *Bambusæ* of *Graminæ*. I mention these specially because I have found their roots largely attacked by sandal. This list will, doubtless, be considerably modified as our investigations make further progress. It need hardly be mentioned that as far as possible the auxiliary species selected should consist of species indigenous to the locality and capable of enhancing the value of the plantation by the timber or other produce they yield. I should not depend upon only one or two kinds of associates, but would have as many different species as possible.

### (III) *Mode of stocking.*

52. Mr. D. E. Hutchins has given in his note already referred to a detailed description of the two principal methods of stocking, namely (1) sowing *in situ* and (2) planting, which were tried in a variety of ways in the Mysore Province. The

results of these operations as reported by the late Mr. Ricketts and Col. Campbell Walker are given in full in Mr. P. M. Lushinton's notes, which also contain the results of similar operations conducted in Coorg and elsewhere. From all that has been written on the subject, one gathers that the artificial reproduction of sandal has not proved a success. Whether this is due to something inherent in the species which prevents its artificial regeneration or whether it is due to faulty systems of sowing and planting adopted, it is difficult to determine with the data available. My own idea is that there is nothing in the innate nature of the sandal itself to prevent its regeneration in a plantation, provided its peculiar root-parasitic habit and its requirements in consequence of that habit are duly considered and provided for.

Of the two modes of stocking I think sowing *in situ* is preferable to planting for these reasons—(1) its cheapness; (2) its being more in accord with the method adopted by nature; (3) its freedom from the risks of damage to the young roots of sandal and their root-connections with other plants; and (4) freedom from watering. I believe the Mysore and Coorg Forest Officers have given up planting altogether and are adopting the method of sowing *in situ*. Which of the several modes of sowing broadcast, or in patches, or by dibbling in, or a combination of any two or all the three should be adopted, is a matter for local conditions and circumstances to decide. Whichever the method adopted, the sowings should be amidst or under the shelter of scrub or bushes, and never in the open. The operation should be done at the first burst of the south-west monsoon, generally May to July, so that the young seedlings may have a good start before the succeeding hot weather begins.

If the site contains natural sandal trees scattered over it, root-suckers may be encouraged to sprout up and supplement the seedling crop by exposing and slightly injuring their roots here and there.

### (3) *After-treatment.*

53. I should strongly object to *weeding* of any kind if that term includes pulling up by the roots. It is a most dangerous operation in the case of sandal, which establishes very early root-connection with surrounding vegetation. If there is danger of its being choked up, the surrounding growth should be cut back above the ground, taking care not to disturb the roots and not to expose the seedlings to the sun. More than this is quite unnecessary and probably injurious. As the seedlings grow their crowns require to be free while their stems need shelter, and all our *after-treatment* operations such as *cleanings* and *thinnings* should be limited to afford these facilities. Pruning is hardly necessary, and must be avoided unless it could be done skilfully, as otherwise there is greater danger by doing it than

from no pruning at all. Of course, the plants should be freed from climbers, which should be cut back but not grubbed up.

The young plantation must be rigidly protected from fire and cattle, but if the growth of grass is dense and likely to choke up the seedlings, either the grass must be cut off or light grazing allowed. In a well formed plantation, with the ground adequately sheltered by the auxiliary species, the growth of grass should be at a minimum.

54. These notes do not profess to be either complete or altogether original. I have ventured to submit them to the readers of the "Indian Forester" because I feel that there is much more yet to be learnt of the life-history and silviculture of this most valuable of all Indian Forest trees than we already know. Should this article excite further discussion of the subject in all its aspects and lead to definite and precise conclusions, I shall feel fully rewarded,

CAMP TIROPATUR : }  
16th May 1904. }

M. RAMA RAO.

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### **A Report on Indian Gums yielded by species of Acacia.**

MORE than ordinary interest has lately been created with regard to Indian edible gums on account of a request made by a large firm of confectioners in England for a regular supply of gum of uniformly pure character. The commercial East Indian gum is a mixed article, and always realises a lower price in the London market as compared with Soudan gums of North Africa. Among some recent quotations it is shown that while £14 was asked for "Turkey sorts," a selected quality of Soudan gum, only 15s. to 20s. per cwt. was obtained for gum Arabic exported from Bombay. The species of *Acacia* growing in Northern Africa are allied to and in some cases are botanically identical with those of the Indian peninsula, and this fact warrants a careful investigation into the exact species grown in this country, and a consideration of the production and collection of the secretion before it reaches the hands of the merchants. What is particularly required is to know the variation in the quality of gum yielded by a particular tree, and to study the causes of the variation, whether of soil, climate, age of tree or season of collecting.

During the past ten years numerous samples of gum have been contributed by Forest officers and others, and are now arranged in the Economic Court of the Indian Museum. Many of the specimens were specially collected in response to a circular note (No. 4 of 1894-95) issued by the Reporter on Economic Products calling for information and specimens of the products of the Babul tree (*Acacia arabica*). Correspondents were asked to give the time of year the gum usually exuded and the amount afforded by each tree, and to state what they knew regarding the uses and

trade in the gum in their respective districts. The notes and specimens supplied in response to the circular are of great value.

The gum of *Acacia arabica* exudes naturally during the hot weather, and is collected very generally during the months of February, March and April. Older trees yield more gum than young ones; a correspondent in the Central Provinces observing that trees from 10 to 15 years gave half a *sér*, from 15 to 20 years three-quarters of a *sér*, and from 20 to 40 years one *sér* of gum. The colour is noticed to be clear and white in young trees, but as they mature the colour of the gum changes to a red or darker tint. The best white gum is worth Rs. 12 to Rs. 13 per maund, and the red and mixed kinds only Rs. 6 to Rs. 7 per maund.

The gums of other trees are mixed with Babul gum so that in the market, where they are sorted according to their colour and appearance, it is difficult, if not impossible, to find the product of one tree appearing under a recognised trade name. For instance, there is a variety of East Indian gum known as "Amrad;" this term is acknowledged to indicate a collection of this article made in, and exported from, Berar and derived from Oomrawattee or Amraoti, the chief town of the district. Its characters on the whole agree with those of Babul gum. Then another term is "Ghatti," representative specimens of which differ considerably from the *Acacia* gums in the degree of solubility, hygroscopic property and absence of red-coloured tears. The samples of Ghatti gum from different provinces agree in nearly every respect with the exudation from *Anogeissus latifolia*, or "Dhaura" tree.

In the following table there is exhibited the result of an examination of all the samples of gum of the species of *Acacia* received in the Indian Museum. They have all been tested for their viscosity by assigning a figure to each which indicates the number of seconds taken when 50 cubic centimetres of a ten per cent solution are made to flow through a cylindrical tube with a narrow aperture of fixed calibre below.

The appearance of the gum and of the solutions, and its reaction with ferric chloride, are features which are useful for purposes of comparison.

## ACACIA ARABICA GUMS.

Reg. No.	Year.	Whence obtained.	Water.	Ash.	Viscosity.	Appearance.	Solution.	Reaction with iron chloride.
4903	1894	Kistna, Madras ...	12.75	2.20	26	White and amber	Light colour	Dark-green.
5038	1894	South Arcot " ...	12.20	2.20	26.5	Whitish	Good	Darkened.
5041	1894	Salem " ...	11.00	1.95	45	Light-brown	Light	Black.
6460	1895	N. Circle (supr.), " ...	12.10	2.20	39	Whitish	"	Green-black.
6461	1895	N. Circle (infr.), " ...	11.50	3.35	40	Amber	"	Darkened.
7894	1896	Masulipatam " ...	12.70	2.55	32	Dark-red	Light-brown	Black.
14282	1899	Trichinopoly " ...	12.75	2.50	23	Amber	"	Green-black.
14644	1900	" " " ...	14.40	3.90	17	Mixed	"	"
7871	1896	" " " ...	12.05	2.70	28.5	Light-amber	Light	Gelatinised.
7893	1896	" Bilimora " Bombay	12.90	2.40	28	Mixed	Light-brown	Light-colour.
7981	1896	Poona " ...	12.85	1.60	35	Whitish	Colourless	Nil.
8136	1896	Karachi " ...	13.15	2.45	21	"	Good	Thickened.
8407	1896	E. Khandesh (Kawrf) " ...	11.80	3.30	19	Reddish	Dark-brown	Green-black.



## ACACIA ARABICA GUMS.

Reg. No.	Year.	Whence obtained.	Water.	Ash.	Viscosity.	Appearance	Solution.	Reaction with iron chloride.
8408	1896	E. Ghandesh (telia) Bombay	12.05	2.25	27	White	Light-brown	Dark-green.
14238	1900	South Thana "	11.60	1.60	115	Cream colour	Nearly colourless	Gelatinised.
14238-1	1900	Surat "	13.00	2.55	23	Mixed	Brownish	Black.
14238-2	1900	Panch Mahals "	12.10	2.20	21	"	Red-brown	Dark-green.
4994	1894	Berar	11.60	2.10	26	"	Light-brown	Darkened.
6183	1895	Ellichpur "	11.30	2.15	27	Dark	"	"
6658	1895	Ellichpur "	12.10	2.50	22	Mixed	"	Black.
7107	1896	Bacain "	12.55	2.20	31	White	Colourless	Nil.
7437	1896	Wun "	11.90	2.20	20	Mixed	Dark-brown	Dark-green.
7897	1896	" Anraoti "	13.05	1.90	28	"	Light-brown	Darkened.
9921	1897	Buldana "	13.05	2.40	39	"	Good	"
4815	1894	Damoh C. P.	12.10	2.10	23	"	Light-brown	"
4848	1894	Saugor "	12.05	2.20	30	"	"	Dark-green.
4851	1894	Nimar "	11.40	2.45	26	Brownish	Very Dark	Black

4952	1894	Chanda	C. P.	...	12.80	2.25	jelly	Amber	...	Light-colour	...	Gelatinised,
12655	1899	Bilaspur	"	...	12.10	2.65	37	"	...	Light-brown	...	Green-black.
1267	1899	Nagpur	"	...	11.75	2.19	20	Mixed	...	"	...	Darkened,
4555	1893	Punjab	Punjab	...	11.40	2.45	50	Amber	...	Light colour	...	Black.
8311	1896	Multan	"	...	11.80	2.15	25	Darktears	...	Light-brown	...	Darkened.
11574	1898	Lahore (white)	"	...	12.95	3.10	15	Light-brown	...	Whitish	...	Gelatinised.
11574-1	1898	Shirajabad (red)	"	...	11.95	2.30	61	Amber	...	Light-brown	...	Green-black.
12001	1899	Delhi	"	...	12.15	2.75	22.5	Light-amber	...	Light colour	...	Light colour.
14244	1900	"	"	...	12.95	3.55	18	Whitish	...	"	...	Gelatinised.
4457	1897	Rajputana	Rajputana	...	11.40	2.15	jelly	Amber	...	Light	...	"
9259-A	1897	Sharpura	"	...	12.30	2.20	24	Brown	...	Light-brown	...	Dark-green.
10120	1897	Harsoti and Tonk	"	...	11.63	2.15	18	Amber	...	"	...	"
10120-B	1897	"	"	...	11.20	2.35	17	Reddish	...	Red-brown	...	Black.
11622	1899	Dumraon,	Bengal	...	11.45	3.20	26	"	...	Light-brown	...	"
11622-1	1899	"	"	...	12.45	2.85	23.5	Light-brown	...	Light colour	...	Dark-green.
12670	1899	Cawnpur,	U. P.	...	13.25	2.85	25	Mixed	...	"	...	Darkened.

## ACACIA CATECHU GUMS.

Reg. No.	Year.	Whence obtained.	Water.	Ash.	Viscosity.	Appearance.	Solution.	Reaction with iron chloride.
...	1846	Palamau, Bengal	...	4.75	18	Brown, glossy	Dark-brown	Precipitated.
336	1891	Eurat, Bombay	12.00	3.40	19	Dark	Light-brown	Gelatinised.
887	1891	Satara, "	12.10	3.20	Partly soluble	Light-brown	"	"
12042	1899	Pegu, Burma	12.40	3.20	16	"	Red-brown	Black.
12671	1899	Cawnpur, U. P.	11.75	3.90	17	Dark	Brownish	Gelatinised.
14239	1900	North Thana, Bombay	11.85	3.40	20	Light-brown	Light-brown	"
14239-1	1900	Central "	13.40	3.40	16	"	Fair	"
14239-2	1900	South "	12.75	3.45	16.5	"	"	Darkening.
14239-3	1900	Panch Mahals "	15.55	3.34	23	Mixed	Brownish	Gelatinised.
<i>Acacia farnesiana.</i>								
820	1891	Bahrach, U. P.	12.55	2.40	40	Dark	Light-brown	Gelatinised.
14249	1900	Chandausi "	18.50	3.65	jelly	Honey coloured...	Fair	"
14701	1900	Salem, Madras	10.25	2.00	23	Whitish	Good	Darkening.

14194	1900	Baluchistan	...	...	11.50	3.65	31	Whitish	...	Good	...	Gelatinised.
15428	1901	Ajmere-Merwara	...	...	14.35	2.90	19	"	...	Fair	...	"
<i>Acacia ferruginea.</i>												
372	1891	Panch Mahala, Bombay	...	...	12.95	3.1	27	Dark	...	Brownish	...	"
<i>Acacia Jaquemontii.</i>												
18037	1901	Baluchistan	...	...	13.40	3.25	22	Light-brown	...	"	...	Precipitated.
<i>Acacia leucophloea.</i>												
337	1891	Panch Mahala, Bombay	...	...	13.15	3.50	50	Dark	...	"	...	
839	1891	"	...	...	14.05	3.20	44	"	...	"	...	
<i>Acacia modesta.</i>												
664	1891	Punjab	...	...	12.55	3.25	30	Amber	...	Fair	...	Gelatinised.
12658-1	1899	Central Provinces	...	...	17.40	4.15	31	Mixed	...	"	...	"
13690	1900	Dehra Dun, U. P.	...	...	11.75	2.50	17	Honey-coloured...	...	Good	...	Nil.
14243	1900	Rawalpindi, Punjab	...	...	12.55	2.65	17.5	"	...	"	...	Nil.

In the above tables the gums of each province are arranged according to their age, those that have been longest in the Museum being placed first. From the examination, however, it does not appear that the viscosity is affected by the age of the sample.

The viscosity of the specimens sent as *Acacia arabica* has a wide range extending from numbers 15 to 61. It is somewhat remarkable that specimens bearing these two numbers were both received from the Punjab, and on the same date; one was distinguished as "white" and the other as "red;" another specimen received in 1893 from the Punjab had the high viscosity of 50, which is exceptional for pure gum Arabic. The majority of samples show a viscometer number ranging from 20 to 30, and these include specimens which were collected by Forest officials as undoubtedly genuine, e.g. 7107, 7437, 8311, 12001.

There are three specimens which should be omitted from the list on account of their resemblance to *ghatti* gum; these are 14238 from South Thana, Bombay, 4952 from Chanda, Central Provinces; and 4487 from Rajputana. The tough character of these samples in contrast to the brittleness of *Acacia arabica* gum, the high viscosity, and the reaction with ferric chloride serve to distinguish them from other kinds.

The colour of the gum to some extent appears to affect the viscosity. Taking half a dozen of the samples distinguished by their colourless appearance or light colour, the numbers given by the viscometer are 39, 35, 31, 27, 26.5 and 21. Contrasting these figures with those of half a dozen of the most highly coloured gums in the list we notice there is a slight lowering of the viscosity represented by the numbers 32, 26, 21, 20, 19 and 17. Upon testing a commercial sample of mixed gum, by dividing the white from the amber coloured tears, it was found that a reading of 25 was observed in the solution of the white, while a reading of 22 was observed in that of the coloured fragments; the viscosity of the original mixed sample was 23.

The two samples of gum received in 1896 from East. Khadesh District, Bombay, were taken from different varieties of *babul* trees known respectively as *Kaori* and *Telia*. Whatever these varieties are botanically, the gums differ considerably in colour and consistence of the mucilage; the *Kaori* showing a dark colour and a viscometer reading of 19, while the *Telia* is a lighter coloured gum with a viscosity of 27.

The two samples received in 1898 from the Punjab, and distinguished as "white" and "red," were obtained from different districts, the white from Lahore and the red from Shirjabad, but I am inclined to believe that these gums were sorted according to appearance, without proper attention being given to the source of supply. As will be noticed below, other species of *Acacia* than *A. arabica* play an important part in the Punjab in furnishing commercial gums for other parts of India and for export.

To show that too much importance should not be attached to the classification of gums by appearance only, attention is drawn to the characters of two gums sent from the Northern Circle, Madras, in 1895, and distinguished as superior and inferior; except for the colour of the gum and of the solution the properties of the two mucilages is almost identical.

Professor Dunstan, in a note of the gum of *Prunus eburnea*, employs the reading of the viscometer as the chief test in determining the value of edible gums supplied through ordinary trade channels. The viscosity of gum Arabic is fixed at 22.5, which is equal to about 20, compared with the figures in the table shown above. This figure is in my opinion too arbitrary a standard. As I have shown above the viscosity of genuine secretions of *Acacia arabica* varies from 20 to 30 seconds, so that it would be unwise to fix the standard of viscosity at 22.5 for all samples of gum Arabic, seeing that the commercial gum is obtained from more than one species, and the figure is arrived at not as the average of a number of determinations but as the result of the examination of only a single sample.

Turning to the results of the tests applied to gums of other species of *Acacia* we have to consider nine samples of exudations from the Khair tree (*A. Catechu*). The gums are more or less inferior in every respect to those of the babul. They are darker in colour, and the mucilage is not so viscous or adhesive. The highest viscosity number is 23, while the majority of observations place the number below 20. None of the solutions were colourless, and when not giving a reaction of tannin with ferric chloride, they were mostly gelatinised by that reagent. The ash content, it should be noticed, is uniformly above 3 per cent.

Of the samples of *Acacia farnesiana* gum, that from the Punjab is the most characteristic. The peculiarity of this secretion, as pointed out by Mr. J. G. Prebble (*Pharmacographia Indica*, I., p. 550) is the spontaneous gelatinisation of a ten per cent solution. The colour of the gum is most satisfactory, and on the whole it is a desirable product for English confectioners as specified in Messrs. Rowntree's report. The other two samples were more of the nature of *babul* gum.

The sample of gum from *A. Senegal* from Baluchistan might be taken as a type specimen of the best gum Arabic. Through the instrumentality of Captain Tighe, Political Agent, South Baluchistan, a large supply of this gum has been recorded as available for commercial purposes, and it is hoped that the trade in such a pure gum may be developed in this country in place of the imported article. The sample of *A. Senegal* gum from Ajmere-Merwara is not so good as that from Baluchistan; the colour is fair, but the solution is thin and only slightly adhesive. The botanical origin of this gum should be accepted as doubtful, as it was not supported by leaves or fruit of the tree.

Gums sent in 1891 as yielded by *A. ferruginea* and *A. leucophloea* are very dark coloured, and can only be regarded as too inferior for trade purposes.

*Acacia modesta*, of northern India, yields a pale coloured gum consisting of small fragments or vermiform pieces known in the trade as "Amritsar gum." The solutions are almost colourless, and the viscosity and adhesiveness of some of the samples are very satisfactory. The appearance of this gum is quite distinct from that of other kinds usually met with, and it should command a ready sale in Europe.

The conclusions to be drawn from these investigations are as follows:—

1. The gum of *Acacia arabica* varies considerably in colour, the colour being due to the presence of tannic acid. The viscosity taken at the temperatures of 33°—35° C. 33°, ranges from 20 to 30 seconds. The solutions are not usually gelatinised by ferric chloride.

2. The gum is occasionally mixed with that of the *Dhaura* (*Anogeissus latifolia*), which constitutes the bulk of the "ghatti" gum of commerce.

3. Gums obtained from *A. Catechu* afford a weak solution with a low viscosity; the solution is usually gelatinised with ferric chloride; and the ash content is above 3 per cent.

4. *A. farnesiana* gum is distinguished by its yellowish or honey-coloured fragments, and by forming a jelly with ten parts of water (although samples from the N.-W. Provinces and Madras derived from vaguely defined botanical origin were dissimilar).

5. *A. Senegal* gum from Baluchistan is a type of the best gum Arabic in all its properties.

6. *A. modesta* gum of northern India is a light coloured gum giving a mucilage of fair viscosity and adhesiveness.

7. Samples of gums said to be derived from *A. ferruginea*, *A. Jacquemontii*, *A. leucophloea* are of too dark a colour, and should be excluded from a market that supplies gums for edible purposes.

INDIAN MUSEUM:

June 1904.

D. HOOPER.

### A New Termite in India.

TERMOPSIS RADCLIFFEI—N. SP.

THIS new species of white ant is of considerable interest to Forest Officers in the Himalayas. It had been known to exist for many years by the author, and about two years ago I sent specimens to the Editor of the "Indian Forester" for identification, but owing to the rather damaged condition of the specimens this could not be done. Last year Mr. Wroughton, late of the Indian Forest Service, visited Kashmir, and I pointed out where to find

the termite, and told him all I knew about them. Mr. Wroughton then, apparently, sent the specimens he collected to M. J. Desneux (Bruxelles) for identification, and the following description is from his pen. M. Desneux had unwittingly named the species after Mr. Wroughton, but this will now be altered. This termite can be found, in Kashmir, on almost any fairly old blue Pine (*pinus excelsa*) stump by removing the bark at the foot near the ground. The ant does not construct earth mounds like those made by termites in India proper. At present very little is known of this highly interesting species, but I hope to make further investigations this year. As it is the only termite in the Himalayas, and the species is quite new to India, the study of its habits should be very interesting, especially so as by their actions the destruction of pine stumps is greatly accelerated, a fact which should be appreciated by Forest Officers who know the length of time it takes for pine stumps to rot away. The following is the description by M. J. Desneux read before the Bombay Natural History Society, on January 21st, 1904 :—

**TERMOPSIS RADCLIFFEI—N. SP.**

Winged form, upper side yellowish-brown; head and prothorax darker, reddish-brown.

Head rounded, flat; eyes large, almost reniform. Ocelli totally absent. Antennæ larger than head and prothorax, of 24 segments; first segment longer than 2nd, third segment shorter than 2nd. Prothorax narrower than the head, lateral sides depressed.

Cerci long, of 6 segments. Abdominal papillæ long.

Tarsi furnished with a plantula.

The wings venation is that of *termopsis*, notwithstanding some difference.

The costal area is on the whole similar, but while the mediana of *T. angusticollis*, Hagen, of California (the only one living known species of this genus, of which the winged form is described) is nearly straight from base to apex, the mediana of our species is distinctly curved, and the greatest distance between it and the subcosta lies near the middle of its curve.

The sub-mediana is far longer than it is the case with *T. angusticollis*, and the number of veins it emits is also greater.

The veins are almost invisible, with the exception of the costal branches, and of the basal branches springing from the sub-mediana, which are distinct.

Length of body: 11 m. m.

Length and width of anterior wing:  $19 \times 5.5$  m. m.

Soldier: Robust. Head rectangular, reddish-brown, anterior portion darker; mandibles black.

Eyes present, small, ovoid, black.

Left mandible furnished with very strong tooth.



Mesothorax and metathorax furnished with rudiments of wings similar to those which Hagen describes and figures for the soldier of *Termopsis occidentis* (V. *Linnaea Entom* XII, p. ff, pl. 1, f. 8). A peculiar character of this soldier is the exceptional size of the cerci, which are much longer than in any other known termite, and which give to the posterior part of this soldier some resemblance with that of an earwig.

Length: 15 m. m.

Hab: Kashmir Valley (E. Radcliffe, July, 1902.)

The discovery of a *termopsis* in India is of the highest interest. This genus was hitherto only represented by two species inhabiting California and Central America and by two fossil species from the amber of Cenigen (Prussia).

KASHMIR.  
15th June 1904.

E. RADCLIFFE,  
Forest Department.

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## II.—CORRESPONDENCE.

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### Fire Protection in the Teak Forests of Burma.

#### I.

THE *cucethes scribendi* seems to be somewhat infectious just now, and Burma Forest Officers in particular appear to be impelled either to have a fling at Mr. J. S. Gamble, or to call in question the efficacy of fire protection. On the latter subject there appears to be something like a revolution impending, and if a sufficiently strong case can be made out, our present policy of fire protection may have to be altered. And now that I see even my friend Samuel Carr among the prophets (or heretics, which is it?) my own settled convictions begin to feel unsteady, and I look back for evidence from personal experience to sustain me. It may be of interest to others therefore at this time to add my contribution and give a brief account of personal observations on the state of teak reproduction and the effects of fire protection in the forests of the Katha Division, Upper Burma. The "factors of the locality," viz., soil, climate, latitude, rainfall, etc., differ so much in one division from those in another, that I think it by no means follows that causes and results observed here can be held to bear out or disprove conclusions arrived at elsewhere, e.g., by Mr. H.C. Walker, in Lower Burma, or by the Divisional Officer, Pynmana.

There is an interesting forest called the Mohnyin Reserve in this division, with an area of about 35 square miles, situated in latitude 24°-45', which has long presented a problem, not yet I fear solved entirely. It is situated for the most part on level ground with the railway running conveniently right through it from end to end. The growing stock is largely teak in almost pure masses divided up by patches of both evergreen and dry forest devoid of teak, and also by extensive belts of swamp and savannah filled

with "kaing" grass. The teak forest is composed mainly of old rugged trees, a large proportion of which are over mature and generally stag-headed: the majority are over the girdling limit, i.e., 7 feet in girth. In the teak belts the cover is not everywhere continuous and the shade is excessive in parts only: the ground is covered often with a carpet of ferns or annuals, or with grass, and sometimes an undergrowth of shrubs and young trees other than teak. The remarkable feature of the undergrowth is the complete absence of young teak, either as seedlings or saplings: very occasionally an ill-formed sapling may be seen, and well grown poles of 2 feet to 4 feet girth certainly are to be found, sometimes in extensive patches, but seedlings are to all intents and purposes absent, and really one may search for an hour under a canopy of pure teak and not find one. The cause of this absence of regeneration has now been proved to be the covering of the soil with leaves: the big coarse teak leaves commence falling here in January, and have barely finished by the end of April, by which time the ground is *completely* covered with them. The leaves thus shut out the necessary light and heat from any seed already in the ground, and the seed falling from the trees (in March and April) usually cannot reach the soil at all that year, but remains on the leaves. Two years ago the experiment was made of clearing the ground just before the rains of all the dead leaves and undergrowth on a number of small plots: the result was that after the first showers quite a large number of seedlings appeared, even on those plots on which particular care was taken to remove all the seeds visible above ground so that all the new seeds (properly *fruits*) of that year were cleared off. This result showed therefore that the seedlings which appeared were derived mainly from seed of previous years which had become buried below the surface. There the thick pericarp slowly softens, and as soon as the moisture of the first showers reaches them, the seeds are in a condition to germinate: they do germinate at once if the thick layer of leaves which covers the ground is removed so as to allow the warmth of the sun to penetrate: possibly germination takes place sometimes *under* the leaf covering, though I doubt it, for the tender plumule could force through the tough heavy teak leaves.

Teak regeneration is specially in evidence this year outside the fire lines, where the dead leaves have been burnt off, as showers have been falling every few days since the beginning of April: tiny seedlings 2 or 3 inches high were quite numerous on the 12th May. I think there is no doubt, from this property which the teak seeds possess of being able to endure in the ground for years and years, that when a favourable opportunity occurs, such as the present season offers, they get a start and germinate before the seeds of other trees.

Inside the reserve, which I may mention has been protected from fire for 6 years now, a few small plots were cleared, as stated before in 1902; in 1903 a series of long lines 30 feet wide were

cleared and swept in the same way, and showed an average of 800 plants per acre surviving at the close of the rains. This year over an area of 74 acres of almost pure teak forest the grass and small undergrowth was very roughly cut over in February, and the area was burnt at the end of April. The cost of this operation was only about one-tenth (per acre) that of the former elaborate clearing and clean sweeping, and though the early showers rather prevented the burning from being quite thorough everywhere, the seeds are responding readily to the access of warmth afforded, and on May 14th, 15th, I found seedlings springing up pretty universally. I happened to be there just at the right time, for many seedlings showed the 2 cotyledons only (distinguished from other species by their indented apex) and some had evidently just come up during the previous night, for the cotyledons were carrying lumps of fresh earth, showing they had only just broken through the surface. My ill-feeling at seeing that some small plots had been invaded by buffaloes may be imagined; each great hoof mark sunk an inch or two in the soft ground may have flattened out a prospective teak tree ere its plumule reached the surface.

It is seen therefore that by simply burning off the leaf covering over this area of 74 acres this year an abundant crop of seedlings is obtained where before I really believe there was not one young teak below the age of say 30 years. The next question is how to get even a reasonable percentage of these seedlings to survive to take the place of the mature and over mature trees now on the ground which ought to be removed. On the small plots of 1902, which were carefully selected, a certain number of strong plants are surviving now and well established: on the long straight lines cleared last year, which run indifferently through good and bad forest seedlings, still very small, persist in patches: on both these areas however the seedlings have received a certain amount of individual attention since the beginning which would be impossible over a large area. Probably next year if nothing is done, the seedlings of this year which survive will be flattened out by the next leaf fall, for they will not be strong enough then to bear up under the weight of the dead teak leaves. I have seen many of last year's so flattened out, and it is an instance of their wonderful vitality. I think that in many cases they actually creep along the ground under the incubus for about a foot and endeavour to grow up round the edge of the leaf, but by that time the poor etiolated specimen is thoroughly exhausted; and probably the end of the growing season is reached. If not covered up again the root will survive and send up a new shoot next season; and I notice now that many of last year's tiny seedlings for no apparent reason at all are discarding their first shoots and sending up new ones.

I take it then that to protect the seedlings which have been induced to come up on an area we shall have to burn that area for several years in succession until a certain number of young teak plants are firmly established. The question arises, why

regeneration was not effected naturally before this reserve was taken up and fire protection inaugurated? and this puzzles me, I must confess. The surrounding population however in those days was very scanty, and from their dread of the Kachins who live on the hills on either side of the Mohnyin Valley seldom went into the forest: there are no traces of old workings anywhere. I believe then that the forest though it may have been burnt sometimes in patches never did so universally or every year in succession. Now villages have sprung up all round within my memory (7 years), numerous paths cross the reserve, and the railway intersects it from end to end, so that to keep out fire is no easy task.

So far as I have been able to gather from observation teak plants in their first few years are not permanently injured by annual fires, and if then protected any small scars formed are quickly healed over. The shoot above ground is killed each time, but a new and stronger shoot is sent up either from below or just above the ground, and it is not until a permanent woody growth above ground exists that the fire has anything to get hold of; it is then that one side gets scorched, leaving a permanent sore kept open perpetually in which the germs of disease enter, causing eventually a hollow tree: it is at these bare places caused by fire too that the boring insect can obtain entrance to the heartwood, causing the well-known "bee-holes" so frequently met with in this division which lower the market value of the timber by 50 per cent often. My own views are strongly in favour of fire protection: I have seen so much damage caused in different ways by annual fires that I cannot agree with those who advocate the abolition of our fire-protection policy, and would throw open valuable forests to the devouring element which has hitherto been excluded. Granted that it doubles the work and shortens the life of the Divisional Officer and his conscientious subordinates, I dread the approach of the fire-season each year myself with good cause. Still we must aim for the idea—"Meliora speramus"—and the above are only arguments in favour of increasing the staff of superior officers and subordinates. Our Burma forests really need to be controlled by double the number of superior officers aided by four times the present sanctioned scale of subordinates. Fire ought to be our servant and not our master: I believe that by the judicious use of fire over selected areas for short periods only regeneration may be benefited, but if we allow fire to rage unchecked year after year it ends by destroying or seriously damaging the very reproduction which it has helped to bring about.

I do not propose to recapitulate here all the arguments in favour of fire protection, but I should like to quote one or two instances of actual damage done by fire observed and recorded by me in this division.

In 1901 a thoughtless Assistant of one of the Rangoon timber firms had a number of dead teak trees felled and left them lying

in the Galon Reserve forest (at that time unprotected) during the hot weather without taking any precautions. During March some eighty of these trees were entirely consumed by the annual forest fire, which was only a ground fire of dead leaves, without any grass to intensify it. I went all over the ground myself, and I must say I was greatly surprised, for I had no idea till then that the rather feeble flame caused by dry leaves burning could ignite such teak logs. The logs were most of them quite sound and of large girth, some of them over 3 tons I believe, and though the firm had to pay Rs. 1,600 odd for their Assistant's carelessness, the money value of the timber destroyed must have been 4 or 5 times that amount. I have known valuable fallen timber destroyed in other forests also, and I have no doubt the actual loss caused in this way alone by annual fires is a very heavy item in Burma.

The same Galon Reserve is an instance of the need for fire protection on another account. The reserve covers the slopes of a high ridge running north and south for over 20 miles: the underlying rock is mica schist, which disintegrates readily, so that the steep slopes are covered with sharp stones and but scanty soil, though in the hollows and on the level at the foot of the hills the soil is deep enough. On the hills the vegetation is mostly dry and the leaves are shed early, and all burnt off, with the result that the first heavy rain washes off all the covering of ash, soil, and small stones into the streams. Some of these streams now resemble on a small scale an Alpine torrent we were shown in 1890 by Sir Dietrich Brandis, at the sources of which extensive works had to be undertaken to stop the erosion of the slopes: instead of flowing in a narrow bed the whole valley has become covered with the shingle brought down from the slopes, obliterating the original bed of the stream and forming a smooth gently sloping stretch of great width, which is increasing yearly. The leaf-fall if not burnt off annually must I imagine check a great deal of this surface denudation and allow in time a decent layer of soil to be formed, to the permanent improvement of the growing stock. With fire protection too will come an undergrowth which will still further help to hold up the surface and check erosion, and as the reserve is fairly plentifully stocked with the younger size classes of teak (mature trees are scarce) obviously protection is called for.

Many of the other reserves in this division might be quoted also as examples of the necessity of fire protection for the improvement of the growing stock. They are forests with abundance of young teak saplings and coppice shoots, but in which mature trees are scarce owing to their having been over-worked in the Burmese King's time; the cover is often scanty and the ground covered with a strong growth of "thekke" grass, which burns fiercely every year. I have several times come upon places where the fire has actually killed off a number of trees forming a grass "kwin," in which the fire burns more and more fiercely every year, causing the "kwin" to gradually encroach on the forest

proper. Annual fires may have assisted in the formation of the teak areas in these reserves in the first place, but I am convinced that now great damage has been and 'in some reserves' is still being done to the stems and stools of the trees by annual fires. Hence fire protection is being rapidly pushed on, and in a few years more I hope to see every reserve in this division protected.

KATHA :  
1st June 1904.

J. M.

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## II.

As a further authenticated instance of the damage done by jungle fires to valuable timber, I give the following extract from the diary of Mr. G. K. Parker, Deputy Conservator of Forests, for the 26th March 1904:—

"Hlainghwe to Tilon. Marked 13 *pyinkado* logs of licensee Shive Hlai." Only 6 logs any good; the rest burned by forest fires. Shive Hlai stated that he had made a fire-trace round them."

In this case more than fifty per cent of the timber has been ruined: yet *pyinkado* is a hard, durable timber, many logs of which are found lying in the forests, apparently having resisted the effects of jungle fires for years. If the logs were really fire-traced at all, the damage is still more remarkable.

RANGOON:  
20th June 1904.

F. B. MANSON.

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## Reproduction of Teak in Areas of Flowered Bamboo.

Not being in charge of a Kyathaungwa (*Bambusa polymorpha*) division I do not know what stage has now been reached in the discussion of or what decision have been arrived at regarding the treatment of Kyathaungwa teak forests when that bamboo flowers. But I have often wondered why there is this interminable writing about and this interminable waiting for the flowering of a particular bamboo, when many others, spread over areas at least as extensive as those occupied by Kyathaungwa, are ignored. Why are no schemes prepared for Tinwa (*Cephalostachyum pergracile*) which extends over enormous areas in both Upper and Lower Burma, and the gregarious flowering of which I have myself witnessed on more than one occasion; or for Myinwa (*Dendrocalamus strictus*) which flowers yearly to a greater or less extent in almost every division in which it is found; or for those bamboos which are found gregariously in one or two divisions only? From the day the Forest Officer enters Burma he is taught, unintentionally no doubt, but none the less surely, to look upon the Kyathaungwa as a thing apart instead of merely as one of a kind, with the result that numberless

opportunities for studying by actual experiment the effects of different methods of treatment in areas of flowered bamboo have been lost, frequently without comment. Let us then cease this endless writing about the flowering of Kyathaugwa and accustom ourselves to think about the flowering of "the bamboo;" let us evolve some scheme of work for the reproduction of teak in flowered bamboo areas which will become as much or even more a part of the routine work of the Forest Officer as fire protection or the preparation of working plans; and above all let us ask for the extra establishment necessary, and start work at once.

Now, all the proposals that I have seen for the treatment of flowered bamboo areas involve a sudden and very large increase in expenditure, and, if success is to be assumed and other forest operations are not to be neglected, a sudden and very large increase in establishment. The money would no doubt be forthcoming, but the establishment, even if it were forthcoming, which I very much doubt, would be untrained, inexperienced, and useless. In just the same way then as special officers are appointed for the preparation of working plans I should like to see special officers appointed for work in areas of flowered bamboo. They need not be officers of rank above a ranger, should be subordinate to the divisional officer within whose jurisdiction their work lies, and would of course be transferred from place to place as circumstances demanded. I would recommend that the increase in the staff necessary be spread over a period of say ten years; firstly, because a sufficient number of duly qualified men could not be obtained at once, and, secondly, because it is not advisable to undertake operations on a very large scale until they have passed the experimental stage.

I do not propose to enter into any discussion as to the method of treatment to be adopted. The best method can, I feel sure, only be determined by experiments systematically carried out over a series of years; but whatever the method evolved, it will almost certainly be found applicable, except in matters of detail, to all species of gregariously flowering bamboo. Some experiments have already been made, but the results are not generally known, and, judging by the differences of opinion still manifest amongst Forest Officers, are by no means conclusive.

There need be no fear that the extra establishment which I advocate would have nothing to do in the unlikely event of there being in any year no flowering of bamboos in any part of the country, for operations in any one area would probably extend from the year of flowering to a year or two years after the falling or destruction of the dead culms. I would moreover invariably carry out creeper-cutting and improvement fellings (now so much neglected, and to my mind of far greater importance than fire protection) simultaneously with the cultural operations amongst the flowered bamboos.

A re-arrangement of divisional charges and a re-organisation of both the controlling and executive forest establishment in Burma is now under consideration, and the opportunity thus afforded of obtaining the necessary increase in establishment should not be lost. Little or nothing can be done at present. We have not even men enough to carry out the prescriptions of sanctioned working plans.

"THITTAW-WUNMIN."

### **The Ripening of the Cones of *Pinus Longifolia*.**

BABU Birbal, in stating that the female flowers at the base of the flowering shoot only are fertilised, gets very near the solution of his difficulty, but does not appear to be aware of it. I would refer him to page 500 of Mathien's *Flore Forestiere*, 1877, on the subject of pines in general. He will there find it stated that the flowering of pines is not followed by the immediate fertilisation of the ovules. The pollen-tubes do not attain their full development and consummate the fertilisation of the ovules until the month of June of the following year. Until then the cones remain quite small, without developing; but as soon as the ovules are fertilised the cones grow rapidly, and reach their full size either the same or the following year.

RANGOON :  
10th July 1904.

F. B. MANSON.

### **The Review of Forest Administration in India, 1901-1902.**

YOUR anonymous "correspondent" "Rusticus" has given such an unexpected meaning to some part of your January review on the Government of India's Forest Report for 1901-1902, that I cannot help wondering whether he was the author of the original review; and so is in a position to know the meaning which the words used were really intended to convey. If it were the case that he wrote the review, I should be ready to admit that his interpretation of it was correct; otherwise I cannot do so.

"Rusticus" is mistaken in supposing that I think the Government of India are now opposed to the compilation of Working Plans in the Central Provinces, nor can I find anything in my April letter to you which justifies him in making this assumption. I agree with my recent predecessors, and with all other Forest Officers whose opinions on this question have come to my notice, in thinking that, as the Central Provinces are opened up by roads and railways, we should devote a large part of our energies to finding markets for the forest produce thus rendered accessible; further, that when a serious demand exists, but not until then, Working Plans should be made.



"Rusticus" is again mistaken in supposing that we may "now" expect, when Working Plans are made in the Central Provinces, to have more attention paid to the realities of everyday life. Such attention has, as a fact, been paid to the necessities of the situation for some time past; not only before the review appeared in your January number, but also before even the Government of India's Report for 1901-1902 was written.

CAMP:  
10th July 1904.

C. P. FISHER.

### III.—OFFICIAL PAPERS AND INTELLIGENCE.

#### **Instructions for sending Parasitic Fungi to the Cryptogamic Botanist to the Government of India.**

CAREFULLY chosen specimens, selected so as to illustrate all stages of growth of the fungus, should be sent in all cases.

For selection, it is advisable to collect a large supply of the material and to go over it afterwards at leisure, picking out several of the best examples of each stage for despatch. The first appearance, the full attack, and the final condition should be shown.

Specimens should never be packed damp, as this leads to the growth of moulds, which interfere with the examination of the parasite.

In the case of leaf parasites, the leaves should be pressed between blotting-paper while still fresh, so as to prevent the curling up of the leaves on drying. A large number of specimens can, when dried in this manner, be packed into a small space between flat pieces of card-board and sent by post.

Large fungi, such as those found growing on trees, should be very thoroughly dried between blotting-paper for three or four days, changing the paper each day, or in the sun; then wrapped separately in tissue paper and packed in a box or tin.

Soft or brittle fungi may be sent in methylated spirit or whisky, in a bottle, very securely sealed.

When the plant attacked by a parasitic fungus is not certainly known, specimens of its leaves and flowers pressed between blotting-paper should be sent for identification.

Where the localisation of the disease is not apparent (as when the plant is dying from a "wilt" disease), whole plants, including the roots, should be sent. Small plants may be pressed whole and sent by post. Larger ones, such as sugarcane, can be sun-dried, wrapped in gunny sacking, and sent by train. Brittle plants, such as cotton, are best packed in a box and sent by train. Very large plants, such as trees, cannot, of course, be sent whole, and an attempt must be made on the spot to select specimens of the various parts of the plant likely to be diseased.

Roots should always be sent where a flow of gum from the trunk is a symptom of the disease.

It is sometimes necessary to send two or three samples at intervals of a few weeks to illustrate the stages of the disease. Usually, however, a careful search, when the disease is at its height, will yield specimens showing the different degrees of attack.

Some of the leaves and twigs killed by the disease should be collected and sent in the case of leaf and twig diseases, as a special, enduring condition of the fungus often occurs only on the dead parts.

The information particularised in the accompanying list should always be given where possible.

*Information required.*

- (1) Locality (with name of village and district).
- (2) Vernacular name of disease.
- (3) Name of crop or plant affected.
- (4) Area affected.
- (5) Extent of injury.
- (6) Date of first appearance.
- (7) Time of year when disease is prevalent.
- (8) Previous occurrence.
- (9) Conditions of climate, temperature, etc., which are said to favour or check the disease,
- (10) Remedies used.
- (11) Are manuring and rotation practised ?

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IV.—REVIEWS.

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**Madras Forest Report for 1902-1903.**

A RETROSPECT AND A COMPARISON.

ONE hears frequently the remark that progress in forest administration in Madras does not keep pace with that in other parts of India. The statement is generally made by those who have no personal knowledge of the difficulties with which Madras Forest Officers have had to contend, and no very clear idea of the actual state of forest administration in Madras at the present day. Some short account of the progress made during the past decade may therefore be not without interest, and may help to remove an impression which is as unfair as it is incorrect.

At the close of the year 1892-1893 the area of reserved forests was 9,436 square miles, ten years later it was 17,657 square miles, with a balance of 1,798 square miles awaiting settlement. The work of settlement should be completed during the current year; and only those having an intimate acquaintance with forest

settlement can realise the amount of work involved in the settlement of some 10,000 square miles of forest consisting mainly of small scattered blocks. The settlement is acknowledged to be about the best in India, and the forests of southern India have a freedom from rights which is quite incomprehensible to Forest Officers in northern India.

At the beginning of the decade demarcation had been completed over 15,705 miles of boundary line. At the close of 1902-03, 33,984 miles had been completed, and 1,859 miles remained to be done. The maintenance in good order of some 35,000 miles of boundaries will be no small matter.

In 1892 there were practically no Working Plans, and the Report of that year simply states that "there is not much to record under this head." From the Report under review it appears that Working Plans for 3,993 square miles had been sanctioned, and Plans were being compiled at the close of the year for an additional area of 3,316 square miles. Special Working Plans Officers are being employed and good progress is being made.

Under communications and buildings the expenditure has increased from about Rs. 70,000 to Rs. 1,07,000 in 1903. The increase is considerable, and with the staff comparatively free from the exactions of settlement, a further advance in this important direction may be anticipated.

The results of protection at the present time call urgently for the very serious consideration of the Madras authorities. With the large increase in the forest area placed under the control of the department, some increase in the number of offences detected was to be expected, but an increase during ten years from about 9,000 to 23,000 in the number of offences committed is little less than appalling. The increase may either be attributed to improved detection or to less successful protection, but be the cause what it may, the fact remains that about 75 offences are committed daily in the Madras Forests. Undoubtedly the remedy lies in reduced charges throughout every grade in the department, and consequently more definite responsibility.

Ten years ago 15 millions cubic feet of timber and fuel were removed from Government forests, in 1903 the removals amounted to no less than 21½ millions of cubic feet. The gross revenue in 1892-93 was Rs. 15,77,212 and the surplus was Rs. 2,69,54. In the year now reported on the gross revenue amounted to Rs. 25,92,779 and the surplus to Rs. 7,66,224.

The increased surplus is in a way satisfactory, but the proportion of surplus to gross revenue is still very much below what it might be, and what it is in some other Provinces. The main cause of this lies in the fact that the Southern Circle contributes practically nothing to the surplus although it contains some of the most valuable forests in India. Exploration and exploitation are indicated under those conditions, and for this the existing establishment is inadequate. During the last ten year

expenditure on "Establishments" has increased from about 6 lakhs to 8½ lakhs, but the controlling staff is now practically on the same scale as it was at the commencement of the decade. The steady and considerable increase in the surplus justifies some increase in the controlling staff even if it is only on the ground of still further improving the revenue from forests.

Now that the area under Working Plans is considerable, it is time some measure was adopted for their control. Under the Government of India the Superintendent of Working Plans controls the working of all sanctioned plans, but in Madras no one seems to exercise this arduous but necessary duty. It cannot be done in the Board of Revenue's office; and the time would now appear to be at hand for the appointment either of a Forest Secretary, who would also be Superintendent of Working Plans, or of a Deputy Inspector-General of Forests, who besides having the control of Working Plans would in Madras be more nearly equivalent to the Inspector-General of Forests to the Government of India than under the present arrangement the Forest Commissioner can be said to be. Some such arrangement must be made, and the sooner it is done the better for the Working Plans and the forests the working of which they are meant to regulate.

### Cape of Good Hope.

#### REPORT ON FOREST ADMINISTRATION FOR THE YEAR 1902.

THE Annual Reports of four Conservators are embodied in this publication, which contains no Government resolution expressing the orders of Government on the work of the Department as a whole.

The first Conservancy, as the Conservator's charge is somewhat quaintly termed, is the Western one. To anyone accustomed to the concise and orderly Annual Forest Administration Reports of India, the present publication is rather bewildering.

The report is not divided into parts, chapters, sections, nor even into numbered paragraphs. There is no statement as to the total area of forest administered by the Department, and in fact scarcely any mention is made of any forest, with the exception of "30 acres of ruined forest" at Straw Hill. No mention is made of boundaries, or working plans, or of natural reproduction; nor is anything stated as to maps or surveys, nor as to the staff of forest officials, and their salaries. The total revenue for the year is given as £ 3,118, and the expenditure as £ 16,330. The value of timber imported was £ 518,333, and the exports amounted to £ 11,071, of which £ 3,101 was for box wood and £ 7,566 for "other kinds."

The work appears to consist almost entirely of sowings and plantings of exotics, chiefly Eucalyptus, Pines, Cypress, Acacia, etc.

During the year under report,  $294\frac{1}{2}$  acres were sown with  $5\frac{1}{2}$  tons of seed (species not stated), and  $453\frac{1}{2}$  acres were planted. £1,395 worth of plants were sold to the public; £ 500 worth of seed was collected, and £874 worth was bought.

The remainder of the report (36 pages) is devoted to detailed accounts of sowing and planting in 22 different plantations.

The Annual Report of the Midland Conservancy is of about the same length, and occupies 46 pages. It is rather more satisfactory reading than the foregoing one.

The total area of forest is not stated, but the demarcation of reserves has now been completed, with the addition of nearly 84 square miles (of which only  $63\frac{1}{4}$  square miles are capable of being worked) during the year under report; 417,862 c.ft. of timber (chiefly yellow wood ?) were marked for sale during the year, and £55,670 worth of timber was exported from the port of Knysna.

Under the head of fire protection, £35 were expended on work, and the cost of damage from fires during the year is given at £33.

Under working plans, it is reported that the first working plan made in South Africa, which has taken six years to compile, has been sent up for sanction. It applies to the Sourflats forests.

During the year under report, 19,434 trees were felled and yielded a revenue of £4,659.

The total revenue for the year was £ 4,856, and the expenditure was £ 7,326, of which £ 4,358 went in salaries and allowances, and £ 1,688 on plantations and permanent works.

Some ten pages of the Annual Report are devoted to an account of the practical determination of the mean annual increment in an 8-year old plantation of half an acre of cluster pine, in which all stems were still under six inches in diameter. The practical utility of this calculation is not very obvious; it has been made in the most elaborate way by several different methods, and a long discussion about form factors seems to be rather out of place in an annual report.

The third Conservancy is called the Eastern. This report opens with a useful tabulated statement (so far as it goes) of the results of the year's work.

There appear to be about 72 square miles of forest and plantations in this circle.

The report opens with a rather lengthy discussion of some controversial matters in connection with a claim to certain areas by a Municipality. Under the head of fires, fencing, and forest offences, full details are given, as reported by each District Forest Officer.

About 360,000 c. ft. of timber appear to be sold annually from natural forests, realizing from £3,200 to £4,400 per annum.

Altogether £ 5072 were made from sales of timber in 1902, about half being yellow wood. Sowings and planting in nurseries and plantations form a very large part of the work of the Forest

Officials, who were also called upon, *owing to the scarcity of convicts*, to bury 650 horses' carcasses in the Drift Sands! The total revenue of this circle for the year was £7,290, and the expenditure was £19,272, of which £6,200 went in salaries, £3950 on plantations, and £4,319 on planting operations on the Drift Sands.

The fourth Conservancy is called the Trāṇakeian. This report is similar to the foregoing, but is shorter, and contains nothing of special interest.

No statement as to the total area of forest in this circle is given.

The revenue of the year was £4,174, of which £2,872 was derived from timber, and £624 from fines for forest offences.

The expenditure amounted to £10,762, of which £6,286 went in salaries and £2,035 in plantations.

## **A Manual of Forest Engineering.**

BY C. G. ROGERS.

MR. ROGERS' book has been a considerable time in issuing, but we have now got the third and last volume, and can consider the work as a whole. We think the Manual of the greatest possible value to Indian Foresters (both Officers and Rangers), as well as to the many persons (such as planters) who in India have to do their own engineering. Considering the purpose of the book the extreme minuteness of detail is generally justified. For example figure 87 of Volume III shows a hook support on a wire ropeway with every part dimensioned. As Forest Officers who have to erect wire ropeways are generally in divisions at great distances from civilisation, they have usually to construct everything locally, and will therefore be very grateful for full details. Still sometimes we think the descriptions might have been written more concisely. The book is conveniently divided up into three main heads—Buildings (Volume I); Roads (Volume II); and Miscellaneous (Volume III). Quite properly the roads and buildings treated of are not complex; they are just what Forest Officers have to deal with. Volume III is for the most part applicable to the forest alone, and contains information not to be found in ordinary engineering works. It deals at full length with mechanical methods for transporting and handling timber and fuel, and very conveniently brings together a quantity of information on such matters as wire ropeways, sledge roads, water slides, tramways, and timber catching booms for which one usually has to look in a variety of pamphlets and prospectuses. Although no doubt Volumes I and II contain many hints specially useful to Foresters, these latter might make shift to get on with ordinary engineering books as used by Engineers when dealing with buildings and roads, but without Volume III they could not easily obtain the information they need for works of a nature which may be called

forest engineering proper. Mr. Rogers has, as far as possible, described forest transport works actually in action. One form of transport is omitted, however, which we should think would be specially adaptable to forest work in flat country, as for example in Oudh.

We mean the Monorail. We know of one monorail actually in use in the forests, namely, at Alapilli in the Central Provinces. In this same volume is a head for wells. We do not think it has been sufficiently clearly intimated that a well is not merely a hole sunk to the underground water level, and that the object of the well-cylinder is not merely to prevent the sides falling in, but also, and principally, to ensure that the water obtained has been filtered through as many feet of earth as the tube is long. The author has in this volume especially, but also in Volumes I and II, collected all the information possible from brother Foresters; a very sensible plan in our opinion. The book is especially noticeable for the extreme industry with which it has been compiled. The very numerous figures will be most useful. As a rule they are admirably clear, and, as they should be, diagrammatic, but just occasionally the attempt to reproduce photographs has been unsuccessful (*e.g.*, Figure 86 of Volume III). Figure 115 of Volume II is upside down. The print is all that could be desired so far as clearness is concerned, and there are broad margins to the pages, which will be useful for notes. Forest Officers will often want to enter notes which their experience may show to be useful. A special feature is the description given below each figure. The Indices at the end of each volume will be decidedly useful. All Forest Officers should have this book in their library, and the occasions will be rare when Forest Officers need to go further afield for their engineering information. Still the methods treated of in Volume III are constantly improving, and new ones being discovered, and it may therefore be advisable later on to issue a new edition of this volume. For example, the simple plan called telescopic sliding has in small torrents done marvels towards bringing within reach of the market forests previously thought too distant to be exploitable. When a new edition issues we would add the monorail above referred to, if the experience of Forest Officers shows it to be a useful means of forest transport.

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#### V.—SHIKAR AND TRAVEL.

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##### **The Long Round to England.**

The following corrections should be made in the July number of the "Indian Forester":—Page 330, line 37, after "lumbering camps" add "daily;" page 330, line 44, after "the greater" add "value." Page 331, the titles of the two illustrations facing this page should be transposed.

## VI.—EXTRACTS, NOTES AND QUERIES.

**Education in Forestry.**

By W. R. FISHER.

ALL considerable European countries, except perhaps Portugal, have forest schools. In France there is the National Forest School, founded at Nancy in 1826, where, besides the candidates for employment in the State forests, about 350 other students of all nationalities, but chiefly Roumanian, English, and Belgian, have been taught since 1830. There is in France also a school for forest guards and foresters at Barres, in the Département de Loiret, and the best students from this school can rise to the position of forest officers, and may attain the grade of Inspecteur des Eaux et Forêts, corresponding to our Deputy Surveyors of the Crown Forests, though they cannot, on account of their superior age to that of the Nancy students, become Conservateurs, a rank which is not usually attained even by the Nancy men until they have been in the service for about thirty-five years. There are numerous schools of forestry in Germany, the principal ones being Eberswalde, Munich, Tharandt, Tübingen, Giessen, etc. There are several forest schools in Austria, also in Norway and Sweden, one each for Russia, Italy, Switzerland, Holland (chiefly for the Dutch Colonies), Spain, and Belgium. The Japanese have a forest school at Tokio, there are several in the United States, one in India, and one in Burma.

When we consider the extent of the British Empire, and the large area of forests in the British Colonies, it is evident that the establishment of forest schools is necessary in Canada, Australia, New Zealand, South Africa, and Ceylon. Much more has been done for forestry in India and in our Crown Colonies than in the larger self-governing Colonies, except in the Cape of Good Hope, where there has been a scientific Forest Department for the last thirty years. There are Forestry Departments, under trained officers, in Ceylon, the Transvaal, Uganda, Mauritius, the Soudan, and the Straits Settlements, and the West Indian forests have been inspected officially by an Indian Forest Officer with the view of establishing a forestry department. What is now wanted for the Empire is the establishment of a Forest School in Britain which will train the higher forest officers for India and the Colonies, and instructors in forestry for the larger Colonies, where superior and inferior schools of forestry, on the model of Nancy and Barres, must soon be established. For service at home, the future higher officials of the Crown forests will require thorough instruction in forestry and also the instructors in forestry at the Agricultural Colleges, at Edinburgh, and at the school for woodmen established at the Forest of Dean, another of which class is proposed for



Alice Holt Wood. Such a school will also afford instruction in forestry to the sons of our landowners and to men preparing at our Universities for the posts of land agents to large estates.

I propose here to give a short account (chiefly taken from Ribbentrop's "Forestry in British India") of the instruction adopted for our Indian forest officials, who have hitherto formed the principal corps of trained foresters in the British Empire, and to discuss the advisability of now extending this instruction so as to include all the classes mentioned above, whose services are required to make forestry a serious pursuit throughout the Empire.

The necessity for establishing a Forestry Department in India was first realised in 1806, when Captain Watson was appointed Conservator of Forests in Malabar, chiefly to protect the growth of teak and other timbers for the Navy, but a reaction ensued in 1823, owing to complaints of the traders, and the conservatorship was abolished. Great ravages were then allowed in the State forest, and it was not till 1842 that Mr. Conolly commenced the plantation of the famous Nilambur teak plantation, and in 1847 Dr. Gibson, a botanist of note, was appointed Conservator of Forests in Bombay, and in 1856 Dr. Cleghorn, Conservator of Forests in Madras. In 1852 Pegu, with its splendid teak forests, was annexed, and Dr. McClelland appointed Superintendent of these forests; but a permanent policy for the forest administration of India was first laid down by Lord Dalhousie in 1855, Dr. Dietrich Brandis, the brother-in-law of General Havelock, being appointed Superintendent of the Pegu forests in 1856, and the forests of Tennasserim and Martaban being added to his charge in 1857.

Dr. Brandis then introduced those principles of enumeration and organisation to the working of the forests, that form the basis of our present working plans, and created a practical system of working the Burmese forests of teak, with due consideration to the perpetuation of the trees by natural and artificial regeneration.

His conservative policy interfered with the gains of timber merchants, who were very powerful in Rangoon, and they prevailed so far on the Government of India that orders were issued to open all the Pegu forests to private enterprise, but the selection of the trees to be felled was left to the control of the Forest Department. Fortunately the Tharawaddy forests were still worked under complete departmental control, and after a few years' experience the State lost about £1,000,000 in the open forests, whilst the Tharawaddy forests produced a large regular income. Canadian timber merchants still form the greatest obstacle to scientific forestry in the Dominion of Canada.

Dr. Brandis had gained the day against the timber traders, and in 1862 was appointed Inspector-General of Forests for the Government of India.

Up to this time officers were appointed to the Indian Forest Service without any special training, but Dr. Brandis came home in 1866, and induced Lord Salisbury, who was then Secretary of State for India, to appoint trained men for the service. Dr. Schlich and Mr. Ribbentrop, who were trained in Germany, were then sent out to India, and these officers, both of whom eventually became Inspector-General of Forests, greatly assisted Dr. Brandis in his work of establishing a scientific Department of Forestry in India. At the same time, eight candidates were appointed by the Secretary of State for India to undergo training in France and Germany, and these men went to India in 1869. Another batch of trained forest officers went out in 1871, and the Continental training was continued in Germany till 1875, and in France till 1886. Dr. Brandis was deputed to Madras, in 1881, to reorganise the Forest Service in that Presidency, and retired from the service in 1882, becoming Sir Dietrich Brandis, K.C.I.E., and was also appointed a Fellow of the Royal Society, and now, in his eightieth year, he is still working at Kew at a comprehensive manual of the Indian forest flora.

Dr. Schlich, who succeeded Sir D. Brandis as Inspector-General of Forests, was deputed home in 1885, to inaugurate a course of instruction in forestry, at the Royal Indian Engineering College, Cooper's Hill, a place admirably suited, owing to its proximity to the Windsor Forest (14,000 acres), to the beech woodlands in the Chiltern Hills, and to the coppices-with-standards in Surrey and Sussex, and to Kew Gardens, for instruction in forestry and botany.

The course of instruction at Cooper's Hill comprises drawing, surveying, road-making and building, accounts and German, elementary chemistry, and the chemistry of soils and physics, entomology, botany, geology (including that of India), and forestry. Thoroughly practical instruction in forest nursery work, and in planting operations, have been given, and the students have also been taught methods of natural regeneration of forests and thinnings in the Chiltern Hills, and in the fine French forests. Besides this they have spent nine months every year in the Prussian forests, where they are placed only two together, under specially selected forest officers, so as to learn the practical management of large areas of forest.

Cooper's Hill College is now to be closed, as the Secretary of State hopes to recruit the Indian engineers from the various engineering colleges in Britain, coupled with experience gained in one year's practical work with some engineering firm. Fresh arrangements have, therefore, to be made for the instruction of our Indian forest students, and this it is probably intended to secure at one of our Universities. It is no longer necessary to have recourse to the Continental forest schools, for the following reasons:—

Since 1886, when training our men at Nancy was abolished, considerable progress has been made in forestry in Britain. Dr. Schlich, who besides possessing a thorough knowledge of theoretical forestry, has managed a woodland of 3,000 acres in the Ardennes for the last ten years, and also more recently the 8,000 acres of the Duke of Bedford's woods, is a good practical forester. No one can be better qualified for starting a superior forest school for British and Colonial forestry, the necessity for which I have already explained. Continental forest schools do not, as a rule, take a wide view of forestry. Each State in Germany has its own system of management, which is not always applicable to other countries; thus neither the clear-cutting system, practised in Saxony and elsewhere, nor the compartment shelterwood system, are generally applicable to India, where the selection system and the system of coppice-with-standards prevail, and where it is hoped to introduce the group system, which at present is carried on only in the Grand Duchy of Baden, in Europe. It is also necessary that our Indian forest students should have some notions of tropical and sub-tropical forestry, and should know something of Indian history, Indian law and land management, which they will not acquire at a Continental forest school. A succession of experienced Indian forest officers, who have been trained by Dr. Schlich and myself, will be available eventually to succeed us as instructors in forestry, while their services would not be available at a Continental school.

Forest management has also made much progress in Britain during the last twenty-five years. The woodlands of the Duke of Bedford are now managed according to a continuous working plan, so are the High Meadows Woods attached to the Forest of Dean, the working plan for these having been prepared by my lamented friend, Mr. H. C. Hill, who was for sometime Inspector-General of Forests in India. Lord Selborne's woods, near Woolmer Forest, are managed according to a working plan prepared by Dr. Nisbet. Mr. Munro Fergusson's woods in Fifeshire, the Alice Holt Woods attached to the New Forest, are also under working plans. The magnificent forests of France and Germany have been placed at our disposal by the friendly Governments of France and Germany for our students to learn the management of forests on a large scale.

Sir W. Thyselton Dyer, in giving evidence before the late Committee appointed by the Secretary of State for India, to arrange for the future teaching of the Cooper's Hill students, said that one of the most difficult duties that fell to him, as official adviser to the Colonial Office, was the selection of forest officers for the Colonies, and that under present circumstances he could not find properly trained British candidates for such posts. Surely we no longer wish our Colonial forestry appointments to be held by foreigners, and the only way to avoid this in future, as well as to afford the best training for our Indian forest officials,

and to keep up a high standard of forest training for our landowners, land agents, and for future instructors of forestry throughout the Empire, is to take the present opportunity of establishing an Imperial Forest School at one of our Universities.  
—*Land Agents Record.*

### Government Forestry Exhibit

AT THE ST. LOUIS FAIR.

THE Bureau of Forestry of the U. S. Department of Agriculture has prepared for the Louisiana Purchase Exposition the most extensive display it has ever made. The purpose is both to illustrate the work which the Bureau is doing and to show actual forest conditions in all parts of the country. The visitor will see there the most impressive evidence of what practical forestry is, and also its great present and future importance as a means of promoting the national welfare. Lumbering ranks fourth among the industries of the country, and it is a matter of hopeful promise for the permanence of the industry and for the cause of forestry that lumbermen are adopting conservative forest management in their lumbering operations. That agriculture, incomparably the most important of our national sources of wealth, also depends in no small degree on forestry, is not, however, so well understood. Under intensive methods of farming, and with the enlargement of the cultivable area made possible by irrigation, this dependence will become increasingly close. Mining and grazing, too, materially depend on forestry, for mines demand cheap and abundant timber, and the forage which feeds most of the Western stock is one of the important indirect products which, under proper restrictions, the forests may be made to yield. All of these relationships are strikingly displayed in the Forestry Exhibit at St. Louis.

The space allotted to the Bureau of Forestry is in two different, though not widely separated, parts of the Fair grounds. An indoor exhibit is located in the Forestry, Fish, and Game Building, in which is centered also an exhibition of the lumber industry of the United States. A striking and complete collection of photographic transparencies illustrates forest conditions and problems as they are encountered by the Bureau. Typical single trees and forests, the cutting or harvesting of forests and their renewal by natural reproduction, forest planting in treeless regions or where forests have been destroyed, and damage by fire, insects, over-grazing, etc., are shown most clearly. Nearly all of the transparencies are of large size, some of them 4 by 5 feet. They are arranged to be seen from the inside of an arcade illuminated by natural light, with Eastern and Western forest scenes shown on opposite walls. This series is supplemented by a collection of large colored bromide photographs framed in the

panels of the balustrade which surrounds the exhibit space. On the floor between the balustrade and the arcade are cases which display some specially important phases of the Bureau's investigations, together with a collection of all the instruments used in forest work, the publications of the Bureau, etc. Of particular interest is a large case containing long-leaf pine trunks which show the advantages of the new system of turpentineing promoted by the Bureau, and the disadvantages and injurious effects of the old system of boxing. Two other cases exhibit insects and examples of their destructive work. The method of determining the strength of commercial timbers is shown by a testing machine, while the results of tests are shown by charts and tested timbers. There is also a large collection of timbers, both from the United States and Europe, treated by different preservative processes to show the manner of increasing the life of various construction timbers. Several specimens are shown of building and other timbers which have been in use for thirty years or more.

(One of the special features of the exhibit is a relief map of the United States cast upon a section of a sphere 16 feet in diameter. By using this type of map the geographical distortion inevitable in flat maps is avoided, and the real relationship of the various parts of the country and their actual position on the globe are correctly shown. The distribution and character of the forests of the country are shown in different colours, as are the location and extent of national and State forest reserves. The forests managed according to working plans prepared by the Bureau and lands upon which plantations have been instituted under Bureau planting plans are also indicated by special symbols. The situation of forest schools and other institutions which afford training in forestry is shown on the map. On another relief map are shown the location of the proposed Appalachian Forest Reserve, the extent and character of forest and other lands included, and the relation of the reserve to the surrounding country.

The outdoor exhibit of the Bureau is on a tract of  $2\frac{1}{2}$  acres situated about 300 yards south-west of the Forestry, Fish, and Game Building. Here are displayed, on and about a model farm, forest plantations suited to every part of the United States, practical forest nurseries, and the best forms of wind-breaks which are so important for protection of the western farmers' crops and buildings. The co-operative work of the Bureau in this direction has been very successful, and this exhibit is certain to attract much interest among visitors from the regions in which forest planting has proved its usefulness, both for protection and as a means of providing local supplies of fuel and timber. During the past five years plans for such planting have been put in operation under the direction of the Bureau of Forestry on 210 western farms. The model farm represented comprises a quarter

of a section of prairie land laid out on a scale one-tenth the actual linear measurements, to show a model plan for planting trees in a treeless country. Forty-seven forest blocks surrounding this area illustrate pure forest plantations and various methods of mixing tree species. In each of these blocks the trees are given the actual intervals recommended for planting in the different regions to which the illustrations apply. Methods of growing nursery stock from cuttings, transplants, and from seeds are fully illustrated, as are the various styles of screens used for shading coniferous tree seedlings. The cultivation of four varieties of basket willow is also an interesting feature of the outdoor exhibit. Fields, farmsteads, etc., are laid off with growing trees planted along the fence lines and about the home lot.

In addition to the displays described, the Bureau of Forestry will co-operate with the Department of Mines and Metallurgy in a series of comparative tests relating to the best methods of preserving timbers. For this purpose a complete experimental treating plant, consisting of a small cylinder, vacuum, and pressure pumps and tanks for holding the preservative solutions will be in operation on the outdoor tract of the Department of Mines and Metallurgy. Other plants will show the application of the Giussani and Rüping processes. It is expected that one or more runs will daily be made, when ties and timbers from all parts of the United States will be treated. Close to these experimental plants will be found a cylinder whose operation illustrates the best methods of increasing the longevity of fence posts. In a separate building near the treating plants several testing machines will be operated by the Bureau of Forestry for the purpose of determining the strength of different timbers treated by various preservative processes.

The greatest effort has been made in the preparation of the Government Forest Exhibit to give as complete an exposition as possible of the purposes and work of the Bureau. The result, it is hoped, will be peculiarly interesting and instructive to that vast body of citizens whose material welfare is so intimately connected with the adoption of practical forestry.—*Forestry and Irrigation.*

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### School of Forestry for Wales.

As announced in our last issue, a meeting of delegates representing Welsh County Councils was held at Swansea Guildhall on Friday last week to consider the establishment of a school of forestry for Wales. Sir Charles Philipps presided, and he was supported by Messrs. E. Robinson (Edward Robinson & Co., Ltd., Boncath), and C. A. Egerton Allen (representing Pembrokeshire), John C. Harford (representing Cardiganshire), J. Schofield and J. D. Morse (Carmarthenshire), S. H. Cowper

Cotes and M. Powell Jones (Breconshire), and Mr. Davies George (Clerk to the Pembroke-shire County Council).

Mr. Davies George said in addition to the counties represented, Merionethshire, Glamorganshire, Monmouthshire and Denbighshire had selected delegates, while Lord Aberdare and Sir Martine Lloyd had written regretting inability to attend.

The Chairman explained the object of the meeting and the steps which had led to the present conference.

Mr. E. Robinson expressed the opinion that the principality was ripe for this school, as he found wherever he went an almost unanimous feeling in favour of the scheme. Wales, too, was so admirably adapted for tree growing, and in addition to this there was an almost unlimited demand for pit wood for our collieries. The principal part of our supplies now came from France. He observed in the report of a meeting recently held at Carmarthen that Mr. Drummond said there were 1,700,000 acres of waste and unproductive woodland in Wales. Consider what was lost through this, and it should at once convince the delegates how essential it was that this land should be cultivated and attended to by Foresters, who would advise landed proprietors to grow timber on scientific principles. Pit wood, in his opinion, should be mostly grown in the principality, as it would give the growers a quick return on the capital invested. If suitable timber were planted, Douglas fir or Corsican pine, it being a quick growing timber, owners could commence selling the poles at about 18 years' growth, and the final crop could be cut down within 30 years. At least during the period mentioned 120 to 150 tons of pit wood could be cut. This would give a return of 30s. per acre on land, comparatively speaking, not worth more than 2s. 6d. to 5s. per acre. He believed colliery proprietors would prefer the native article, as the timber grew straight and uniform, very lengthy and of a size admirably adapted for pit wood purposes. If a general system of planting were carried out he felt sure a much lower rate would be charged by railway companies for freight, as they could then run special trains, which would in that case reduce the cost of transit quite 30 per cent. This concession should of itself be a great consideration for a general system of tree planting in the principality. It might be thought it was somewhat premature to discuss the question of site, but assuming the delegates agreed with his ideas, one would then have to be purchased between Carmarthen and Newport. This, of course, was a matter of detail when the question was more matured. That the school would be self-supporting after eight or ten years he had not the shadow of a doubt. If the Government refused to advance any money at a moderate rate of interest, County Councils and landowners had power to borrow from the Landowners' Improvement Company at a rate, including principal and interest, if borrowed for 40 years, at the rate of £4 16s. 7d. per annum. He moved—"That

the delegates present recommend respective County Councils to vote £500 for the purpose of purchasing land to pay the cost of erecting the necessary buildings for the proposed school of forestry."

Mr. Egerton Allen seconded.

Mr. Cowper Coles said in Breconshire, while the landlords were more or less in sympathy with the question, he was afraid there was not the slightest chance of the County Council supporting anything in the way of advancing money, because they felt the Forest of Dean School was in touch, and also because at Aberystwyth there was a branch of agriculture which might be extended to forestry, and because there was a grant to be made to Bangor. His idea was that the Government should be asked to extend its work in the Forest of Dean.

Mr. Harford said the first thing his Council would ask was what was going to be done with the £500, and what was the scheme? They could not vote money blindly. He had hoped that the meeting would have been a larger one, and that a decision would be come to to apply to the Board of Agriculture to do something for South Wales. He should like to see a great deal done in the way of educating foresters, but what they wanted to know better was how to treat the diseases of trees, especially those now affecting beeches. As to the proposal now submitted, he did not see how they could do any good by supporting it unless a really definite scheme was put before them. As to Cardigan, the county was very much in favour of supporting the farm school at Aberystwyth. He hoped the conference would recommend that the Board of Agriculture be asked either to extend the Crown schools or establish a fresh school for South Wales.

Mr. Robinson explained that what he wanted was for the County Councils to agree, and then they would be able to go to the Government with some chance of success for financial assistance. It did not follow that the Councils need vote any money, but unless they adopted the course he proposed he did not see how they could possibly approach the Government. He wanted to see a school established and run on commercial lines, for he felt confident that in a few years it could be made self-supporting. As to the school at Aberystwyth, if the scheme were to be successful it must be easier of access.

Mr. Cowper Coles said there was a strong feeling amongst growers that they had been planting too much fir, and had not sufficiently encouraged the cultivation of ash and other hardwoods, which no imported timber could touch.

Mr. Scourfield, while supporting the suggestion, agreed with the unlikelihood of County Councils contributing, and eventually Mr. Robinson reluctantly withdrew his motion, and on the proposition of Mr. Cowper Coles, seconded by Mr. Harford, it was unanimously agreed "That the delegates present strongly



recommend to their respective County Councils the establishment of a school of forestry, and that they consider the best means of carrying the resolution into effect by asking the assistance and advice of the Board of Agriculture in giving a grant to existing colleges or such other schools or colleges as may from time to time become necessary."

It was resolved that a further meeting be held at Swansea, probably in August — *Timber Trades Journal*.

## VII.—TIMBER AND PRODUCE TRADE.

### Churchill and Sim's Wood Circular.

4th July 1904.

**EAST INDIA TEAK.**—There is no change to report in this market. The deliveries for June were 1,568 loads as against 800 in June, 1903, making the deliveries for the first half of this year 5,382 loads, compared with 5,587 loads for the same half of 1903.

**ROSEWOOD—EAST INDIA.**—Really good logs from medium to large sizes sell well, but small inferior wood can only be placed at low rates.

**SATINWOOD—EAST INDIA.**—Some sales have been made at satisfactory prices, but the general demand is still quiet.

**EBONY—EAST INDIA.**—Stocks are ample and sales difficult.

### PRICE CURRENT.

Indian teak, logs, per load ...	... £9-15s. to £18-
" " planks, " ...	... £12-5s. to £20
Rosewood, per ton ...	... £6 to £12
Satinwood, per s. ft. ...	... 7d. to 18d.
Ebony, per ton ...	... £5 to £10

### Denny, Mott and Dickson, Limited.

#### WOOD MARKET REPORT.

London, 1st July 1904.

**TEAK.**—The landings in the docks in London during June consisted of 233 loads of logs and 381 loads of planks and

scantlings, or a total of 614 loads, as against 686 loads for the corresponding month of last year. The deliveries into consumption were 919 loads of logs and 559 loads of planks and scantlings - together 1,478 loads, as against 846 loads for June, 1903.

The Dock stocks at date analyse as follows :—

	6,229 loads of logs, as against 4,982 loads at the same date last year.				
4,034	"	planks	"	2,988	"
—	"	blocks	"	—	"
<hr/>					
Total	10,263 loads		"	7,970 loads	"

The import of teak to London during the first half of the year has only been 4,295 loads, or a falling off of some 20 per cent on the extraordinarily low import for the corresponding period of last year. On the other hand, the deliveries from the London docks into consumption have only been 4,891 loads, which, although about 14 per cent in excess of the imports, conclusively evidence an unduly restricted consumption. As, however, the high prices which have been ruling have not served to increase the import, it must be conceded that the limited outlet from the forests during recent years has been a proved fact, and the higher cost of teak a legitimate consequence. The volume of the trade has therefore suffered; but the falling off in the consumption is also largely due to the dull state of the Shipbuilding and Rolling-stock industries; and should a revival take place before the scarcity of supplies from the forests can be remedied by some relaxation of the restrictions placed by the Indian and Siamese Governments on the working of the forests—and perhaps improved facilities for the getting of the timber to the shipping ports—the price of teak must tend to increase as the supply becomes more obviously inadequate to the demand.

The timber trade has not escaped the general depression which has characterized most business during the last eighteen months. Great caution, with the resulting hand-to-mouth business, has been and is likely for some time to continue to be the attitude of the importers on this side. The heavy slump in Deals has borne hardly on weak holders; and it would be idle to deny that a certain amount of financial distrust has developed, which tends to increase the contraction of business. On the whole, however, losses have been soundly written off, and timber traders should be in a position to take advantage of the improvement in general trade, which must certainly develop itself as the undeniable surplus of national savings over expenditure slowly makes itself felt; and as such surplus savings are invested in fresh industrial work, so will the volume of business in wood expand in common with that for all other material for constructive work.

**Market Rates for Products.***Tropical Agriculturist, July 1st, 1904.*

Cardamoms	...	... per lb.	1s. 6d. to 2s. 7d.
Croton seeds	...	... „ cwt.	20s. to 22s. 6d.
Cutch	...	... „ „	22s. 6d. to 30s.
Gum. Arabic.	...	... „ „	15s. to 27s.
„ Kino	...	... „ lb.	3½d. to 5d.
India-rubber, Assam	...	... „ cwt.	2s. 3d. to 3s. 8d.
„ Burina	...	... „ „	2s. to 3s. 7d.
Myrabolans, Madras	...	... „ „	5s. to 6s. nom.
„ Bombay	...	... „ „	4s. to 7s. 6d.
„ Jubhulpore	...	... „ „	4s. to 6s. 3d.
„ Bengal	...	... „ „	3s. 6d. to 5s. nom.
Nux Vomica, Bengal.	...	... „ „	6s. 6d. to 8s. 6d.
„ Cochin	...	... „ „	8s. to 10s. 6d.
Oil, Lemon grass	...	... „ „	7½d.
Orchella weed, Ceylon	...	... „ „	10s. to 12s. 6d.
Seedlac	...	... „ „	190s. to 210s.
Tamarinds, Calcutta	...	... „ „	7s. to 9s.
„ Madras	...	... „ „	4s. 6d. to 6s.

# THE INDIAN FORESTER.

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[No. 10.]

## Proportionate Fellings in Sal Forests.

(Continued from page 397.)

II. For clearness sake we will take a numerical example. We have a sal forest of 80,000 acres, for which a working plan is required. The method is to be "selection."

We may say *en passant* that we have an actually existing sal forest in our mind's eye, and the following suggestions are based on what would appear to us to be suitable prescriptions for such a forest, and are not purely visionary and imaginary.

Well, this forest in the first place consists of one species, growing under a variety of conditions.

There are certainly two, and we are inclined to think three, distinct types: to wit, the fine, tall, straight-growing one, which is found over considerable areas; next the somewhat less good, but still fairly well-grown type; and lastly, the very poor, open, badly grown, crooked, stag-headed type. It would be manifestly absurd to prescribe one and the same plan for all three.

Further, we notice that these types occur often over considerable areas at a time, and are usually found also on characteristic situations and soils.

Thus, the best type is more usually found almost purely on the lower well-drained slopes of the hills, where the soil is deepest and richest, and in the undulating plain country.

The mediocre type is found, with slight admixture of other species, a little higher up the slopes, where the soil is somewhat shallower, or on less well-drained situations, while the worst type is that towards the upper higher slopes of the hills, on stony shallow soils, often mixed with a large proportion of other species, and in low-lying, damp, water-logged soils.

It indeed becomes a question whether one method can be made applicable to all.

For the present, however, we will suppose that the selection system is to be applied to all three types, as the question of method is outside the sphere of this paper. Accordingly, for the sake of argument, we will take three types as already sketched, depending on local conditions of soil, aspect, and situation.

Each set of woods falling into each type will then constitute a separate working circle to be worked under the same sylvicultural

system, but subject to different working prescriptions. Thus the mature girth of type I (W. Circle I) might be fixed at seven feet. The corresponding girth type II (W. Circle II) would perhaps be six feet, and for type III (W. Circle III) five feet or even less.

In the same way again the length of the felling period in each case would differ. Perhaps for W. C. I it would be fifteen years, for W. C. II twenty years, and for W. C. III thirty years.

The length of the rotation would correspondingly alter in each case. In each W. C. or type there will be several quality-classes, of necessity.

We may indicate these in decimals of 1, the latter representing the standard quality for each type or working circle of a perfectly normal wood, growing under favourable conditions.

The estimates of the other quality-classes will be based on the general condition of the woods especially with reference to height-growth, density and general healthiness of the crop, and must of necessity be ocular, and for accuracy will depend on the capability of the local officer to gauge them properly in their relation to the standard quality.

By reducing all the woods of each series to a common denominator we are enabled to approximate the size of the annual coupes in the several sub-periodic blocks so as to equalise more or less the annual yield. The advantage of reducing the different woods to one quality is to enable us, among other things, to calculate only with areas of equal yield capacity.

Thus, suppose we have a sub-periodic block of 1,000 acres, the sub-period being five years; under ordinary circumstances one would put the annual coupe at 200 acres, and having already arranged the sub-periodic blocks so as to give approximately equalised sub-periodic returns, one would rest content.

But following the above method we find perhaps that the above 1,000 acres consists of two quality-classes, one 600 acres with a mean quality figure  $\cdot 6$  and one 400 acres with quality figure  $\cdot 4$ , as compared with the standard wood of normal quality 1.

Hence the total reduced area becomes  $600 \times \cdot 6 = 360$ , and  $400 \times \cdot 4 = 160 = 520$  acres and reduced area of annual coupe =  $\frac{520}{5} = 104$  acres.

Consequently the sizes of the coupes in the above sub-periodic block will be  $\frac{104}{\cdot 6} = 173\cdot 3$  acres over area of quality-class  $\cdot 6$  and  $\frac{104}{\cdot 4} = 260$  acres over area of quality-class  $\cdot 4$ , and the coupes will be as follows :—

Coupe No. 1	=	173·3	=	173·3	acres.
"	"	2	=	173·3	= 173·3 "
"	"	3	=	173·3	= 173·3 "
"	"	4	=	80 + 140	= 220 "
"	"	5	=	260	= 260 "

In other words, instead of merely approximately equalising the yield over each sub-period, we have gone further and divided our sub-periodic blocks into annual coupes of equal yield capacity, thus effecting a still greater gain. The above, if thought too elaborate, may be omitted, as it is not absolutely essential. Or we may content ourselves with two quality or density classes based entirely on number of exploitable trees per acre and on general healthiness of crop.

III. We now come to the most difficult question, the calculation of the normal growing-stock in each of our type-areas, and the formation of proper age and girth gradations.

For the sake of clearness we will suppose the areas of our three types to be respectively 8,000, 40,000 and 32,000 acres.

We will proceed to take type II area as our example :

Here the area (A) = 40,000 acres	} = 160 years	The annual coupe = $\frac{A}{L} = \frac{40,000}{20} = 2,000$ acres and number of age or girth gradations (since one may change the one into the other denomination at will) = $\frac{r}{l} = \frac{160}{20} = 8$ ; or 9-in. girth classes.
Length of period (L) = 20 years.		
Length of rotation for 6'		
Mature tree (average)		

Then the distribution of coupes will be theoretically as follows :—

Coupe No. 1 (youngest).			Nos.	Coupe No. 20 (oldest).		
1	year old trees = 250 acres			20	years old trees = 250 acres.	
21	do.	do.	(Intervening coupes Nos. 2-19 inclusive.)	40	do.	do.
41	do.	do.		60	do.	do.
61	do.	do.		80	do.	do.
81	do.	do.		(3' 6") 100	do.	do.
101	do.	do.		120	do.	do.
121	do.	do.		140	do.	do.
141	do.	do.		(6' girth) or 160	do.	do.
Total ... 2,000 acres.					Total ... 2,000 acres.	

Knowing the average girth increments per annum by 9-inch girth classes from sample-plot readings and *ergo* the average age of trees of girths falling into these classes, we can by interpolation by means of diagrams read off girths corresponding to any age we require. Thus in our second type our rotation is 160 years for a 6-ft. tree. The corresponding girth of 100 years is 3'-6". Consequently, by interpolation, we can ascertain the exact or approximately exact girths that should correspond to ages of 120 and 140 years, and so on.

We now know, therefore, a very important fact, and that is that in a normal forest the area under first class timber at any time must be 250 acres or one-eighth of annual coupe.

The next point is to ascertain the normal growing-stock on that area, *i. e.*, the number of mature trees per acre.

To do this we must look upon our selection forest from the standpoint of a high forest under the clear-cutting system, for

the two are identical, except that in the former all age or girth-gradations are found pell-mell on the area, while on the latter each gradation is distinct by itself.

Now we take it roughly that the ideally normal growth in a clear-cut high forest, in its oldest gradation, is present to all intents and purposes, when the crowns of the trees, being perfect just touch and no more, that is, when you have a complete, uninterrupted canopy overhead. We do not say that it is absolutely so, but near enough for our purpose. Did there happen to be more or less number of trees the crowns would no longer be absolutely symmetrical, but lop-sided and compressed, or top-heavy, as the case might be.

Well, it seems to us there is no reason why we shouldn't take advantage of this more or less self-evident fact and employ it to solve our problem and determine the normal growing-stock composing the first and other classes in our selection forest. We have, therefore, to measure a number of crowns of ideal first class trees so as to obtain the average crown basal area.

This may be done by actual measurement of the projections of their crowns, or of the projected shadow of the crowns, that of a tree at noon being as near as possible correct.

As a matter of fact any time of the day would do, as the projected diameter of the crown necessarily remains constant, but noon will give almost the true shadow, or we may make an ocular estimate of the basal area of the average first class tree.

Of course we must choose average first class trees with as perfect crowns as we can find. Suppose eventually we find that the mean crown basal area of a first class tree is so many square feet, we can at once estimate the exact number of first class trees having identical superficial crown areas, which represent the ideal or maximum normal number per acre, and which allow of their crowns just touching and no more.

This, then, gives us the approximately ideal number of trees of first class to the acre. Perhaps this is ten. Then we know that at any moment number of first class trees in the forest should be  $250 \times 10 = 2,500$ . Similarly for all other girth classes, the normal numbers per acre corresponding to intermediate girth classes being found by interpolation.

Here we have a definite basis, if a somewhat rough one, to start from; at least a sufficiently solid foundation on which to build our superstructure.

To continue our concrete example, we will suppose the normal numbers per acre in II class to be 12

III " " " 17  
IV " " " 20

which is the same as saying our normal growing-stock of II class trees should be  $250 \times 12 = 3,000$

$$250 \times 71 = 4,250$$

$$250 \times 20 = 5,000.$$

It is, of course, a matter of opinion how far we may elect to go down the scale, but as far as we are concerned four classes will probably be sufficient as the lower classes may reasonably be expected to be sufficiently numerous to be able to work out their own salvation provided only they are judiciously thinned at intervals, which thinnings will depend on local conditions of soil, time, place and market.

Then theoretically in each annual coupe the possibility will work out to—

$$\begin{array}{l} 250 \text{ by } 10 = 2,500 \text{ I Class trees (final yield)} \\ + 250 \text{ by } (x - 12) \text{ II Class trees} \\ + 250 \text{ by } (x' - 1') \text{ III Class trees} \\ + 250 \text{ by } (x'' - 20) \text{ IV Class trees} \end{array} \left. \vphantom{\begin{array}{l} 250 \text{ by } 10 \\ + 250 \text{ by } (x - 12) \\ + 250 \text{ by } (x' - 1') \\ + 250 \text{ by } (x'' - 20) \end{array}} \right\} \text{Intermediate yield.}$$

Where  $x$ ,  $x'$ ,  $x''$ , etc., represent average actual growing-stock per acre (in numbers of trees) in classes II, III, IV, etc. respectively. Here let  $x = 10$ ,  $x' = 20$ ,  $x'' = 24$ . In other words, Class II is in deficit and Classes III and IV in excess of the normal, and Class I may be in either.

For our present purpose we consider trees below Class IV (*i.e.*, 3' 9" to 4' 3" girth) as unutilisable, and whether thinnings or not are to be made in lower classes, we would leave to the discretion of the operator, who may settle the question on economical or silvicultural grounds to his own satisfaction.

Theoretically we say, but practically this is what happens. Our period is twenty years. We institute a thinning every ten years, *i.e.*, at half the period. We take out all our first class trees in our final felling, except any we may be compelled to leave for purely silvicultural reasons. We are at liberty to remove in addition —

No. II class trees as we are already short in this class to the tune of two trees per acre, or 500 on whole area under Class II.

$$\begin{array}{l} 3 \text{ III class trees} \\ 4 \text{ IV " " } \end{array} \left. \vphantom{\begin{array}{l} 3 \\ 4 \end{array}} \right\} \text{per acre.}$$

But there are accidents of nature to be discounted and forestalled, for much may happen in twenty years.

We must therefore leave a "margin of safety" as a safeguard against the unexpected, as well as leave extra numbers in classes III and IV, to make up the deficiency in Class II eventually.

We cannot remove any second class trees, as we are short of them already, only we should, if necessary, take out any that are dead or dying, which cannot possibly remain sound till the next period.

We remove then, say, in our first thinning, simultaneously with the major felling, perhaps only 500 third and second class trees, and after ten years (*i. e.*, half period) another 500. Of course the actual numbers or proportion to be removed must be



determined by circumstances and experience. We are altogether 500 in deficit in Class II, and 1,650 in excess in Classes III and IV.

Hence we may remove in our two thinnings just as many of the 1,650 as will leave sufficient to make good this 500 deficit eventually. Here we allow 650 to replace the 500. In other words, we adopt a graduated system of proportionate fellings.

There is one other supposition, and that is where possibly the actual number of trees of each and every higher class is less than the normal number, as in the case of a wood badly over-cut. In such a case we must forego cutting green trees at all in those classes, and must leave a larger proportion also in the next lower class or classes to make good this deficiency in time.

The actual growing-stock can be found by actual enumeration over the whole or a portion of the area, or estimated by means of "sample plots" or linear surveys. Where outturn statistics are available as here, we may calculate our main yield by classifying areas felled over into type classes, and dividing the outturn of these areas by area of each type class which will give an average outturn per acre for each type. If we wish to show our yield in cubic feet we may consider the normal growing-stock as being equal to the volume of the oldest age-gradation multiplied by half the rotation, or the mean current annual increment which we must take to be equal to the mean final annual increment multiplied by the whole growing-stock multiplied by half the rotation. Our final mean annual increment here is  $\frac{6}{160}$ .

Then normal growing stock  $rGn = \frac{I \times n}{2}$  where  $r$  = rotation and  $I$  = the age of the oldest age-gradation. Now the oldest age-gradation consists as seen of 2,500 trees (the normal number), and from experimental fellings we know the average first class tree yields 'a' cubic feet.

$$\text{Then } rGn = \frac{2,500 \times a \times 160}{2} = 2,500 \times a \times 80 \text{ c. ft.}$$

$$\text{or } = \frac{i \times n \times 160}{2} = i \times n \times 80 \text{ c. ft.}$$

Where  $i$  stands for the final annual mean increment, or current annual increment, as the case may be, and  $n$  the total number of trees of all classes and ages in the forest— $n$  can be found from results of direct enumeration or other estimated survey, and from sample-plot annual increment readings. Or we can give our normal growing-stock in number of trees. Here we are obliged to admit a fallacy, but not, we think, an irremediable one. It is, that we are taking the growth of sal to be uniform throughout. This is not the case of course; the rate of growth varies at different periods or stages of its life-history, now faster, now slower than the average normal final annual increment on which we have based our calculations.

The remedy again is not far to seek. It lies in allowing a greater margin of safety in the slower growing periods, and less in the faster.

This again is a matter of circumstance and experience.

With this to guide us we should very soon get a fair estimate of our forest as it stands in relation to the normal forest, and pick our way accordingly.

It may be said that in practice the difficulties would be great because you must remove badly growing trees over promising younger stuff, and this will put your proportions all wrong. To get over this, it must be made a rule only to cut up to the maximum and then stop, and if any badly grown trees remain, it cannot be helped. Most of the lower classes will, as a rule, be so numerous as not to matter much, and one may leave them to compete on nature's lines and to do their own thinning, looking only to the final result, which will be the survival of the fittest.

Of course one would start on the badly grown trees, and only go on to the good ones if it was necessary to make up one's numbers.

Our example is necessarily an impossibly ideal one, but it is the principle that is the thing. Experience alone can determine the extent to which it can be developed in actual practice, if at all.

In time, as the forest itself, the girth or age-gradations, and increment became more normal, the lower classes would almost of necessity fall into line automatically.

Lastly, with regard to the question of thinnings or improvement fellings, that is subsidiary or auxiliary fellings as opposed to and distinct from the major or selection fellings. That some such periodical thinnings will be necessary, nobody will deny, but their nature and extent is yet to determine. We have suggested that there should be two per period. The first simultaneously with the major felling, and the second at the expiry of half the period, or, in the case of a longer period, every ten years. This would be for convenience and economy in working.

Better do away with the name "improvement fellings" altogether; the term is to be distrusted, since in unscrupulous hands it has shown itself to be capable of many and exceeding vagaries, and instead institute "weedings" in the younger, and "intermediate thinnings" in the older classes. That is, "unutilisable" stuff would fall under the former, "utilisable" material under the latter, if it is wished to define them sharply.

With regard to these weedings the material that comes out will be unsaleable as a rule, and so it will become a question whether the superfluous trees in the lower classes should be removed as a cultural operation, or whether we should not omit them in the lower classes, leaving these to nature's thinning, and only commence operations in those capable of giving some utilisable, i.e., saleable material.

This must remain a problem for the economist.

But from the late Mr. Dickinson's tables there can, we think, be little doubt that judicious thinnings in young sal forests are undeniably sound sylviculturally.

The difficulty of estimating the effects of these thinnings will increase as we go up the scale, and we should attain *Au comble* when we come to the II Class, for there must always necessarily be immense difficulty in applying proportionate thinnings to a forest worked under the selection system, with its irregular-aged woods, as compared with the simpler, more regular, even-aged classes of more regular systems. For it is comparatively easy, or should be, to determine in regular even-aged woods that at a certain age such or such a percentage should remain or be cut out of the whole, but in uneven-aged selection forests, where all sizes and ages are represented pell-mell on the ground, there will be much more liability to error in determining what percentage of each must remain or come out, as no one acre, probably, has quite the same proportion of classes on it, and the effect of removing trees is not so marked as in even-aged woods where the trees are approximately all the same height. Still, while admitting this difficulty, we do not consider it to be insuperable.

As to the intensity and extent of these thinnings, we must proceed with caution, and it will be advisable to err on the side of leniency, that is, of light thinnings, till we are in a position to lay down the law. We should be sure to leave a sufficient margin of safety to meet every conceivable and possibly inconceivable contingency, or mishap. The margin of safety should be determined, in the first place, by the healthy appearance or otherwise of the trees in detail and of the class as a whole.

Thus if it appears likely that the 17 trees in class II selected as the "trees of the future" may reach maturity safely, we may remove 2 and leave 1 as our safety figure, and at the end of ten years remove it or not as we think fit.

If, on the other hand, some or all are unhealthy, we should increase our margin of safety proportionately, and remove all the rest.

Of course at the outset the results can hardly help being approximate, but as time goes on, experience is gained, and more data become available, gradually things will be brought to a sufficiently correct standard beyond which we cannot hope nor wish to go till we are in possession of accurate yield-tables. So much for intermediate thinnings, as they will be termed.

The advantage we claim for this system, if it is worthy of the name, is that no matter whether the actual growing-stock is too little or in excess, by a careful application of these rules we cannot fail in the end to establish more or less normal conditions, and therefore a normal growing-stock.

We seek to establish a normal increment and normal girth gradations, the natural consequence of which must be that

the growing-stock will fall into line ultimately and become normal.

Where any class is deficient in numbers, then all except dead and dying trees should be left if necessary, and if it comes to the worst a few even of the 1 class trees, the more healthy of them, that is, may be left if in excess of the normal numbers, to make up for the deficit which would otherwise come in the next period.

During the first period the final yield may not be normal, but it will, at least, approximately be known beforehand.

With each successive period the final yield should approach nearer to normal conditions, and each time the final yield will more and more nearly approximate to the normal final yield, though of necessity the intermediate yield must always vary considerably between limits.

We cannot, therefore, associate ourselves wholly with the view that proportionate fellings can find no place in half-ruined forests, though doubtless this view is correct in the broad sense. They seem to us, if properly applied, to be equally applicable anywhere, though with modifications.

Of course there are various cases where a divergence will have to be made.

Thus in areas where young growth is absent we cannot of course apply our proportionate fellings or intermediate thinnings — nor any other sort of fellings for the matter of that — blindly, and *sine qua non* must be that regeneration is thoroughly established before we proceed to remove the stock automatically, regardless of the future.

To recapitulate: we take as an undisputable axiom that no working plan can be sound theoretically which fails to institute a comparison between the actual and normal growing-stocks of a forest.

From this we deduce three main maxims, namely—

1. The creation of a normal growing-stock.
2. A sustained annual final yield.
3. The utilisation of the annual increment.

From this we proceed to lay down the following principles or objects:—

- (a) Over-cutting to be made impossible by fixing the minimum girth of mature trees.
- (b) Different prescriptions for different parts (often overlapping of a forest of one species growing under a variety of conditions).
- (c) The essential grouping of several coupes into sub-periodic blocks, so as to equalise the outturn, combined with the desideratum where possible of a more or less equal annual coupe, while permitting one to meet sudden fluctuations of the market (*vis.*, rise or fall in demand).

- (d) Under-cutting to be avoided by periodical judicious "intermediate thinnings" with margin-of-safety checks against over thinning.
- (e) The formation of girth or age gradations and the execution of proportionate fellings.
- (f) The separation of weedings (cleanings) and thinnings in the auxiliary fellings.
- (g) The thinnings to be two per. period, the first simultaneous with the major felling, and the second at the end of the half period, or at 10-year intervals.

Having had our say, and built up our "Castle in the Air," it only remains for some unkind critic to demolish it, or prove it is only a mirage of the brain after all. In which case will we plead guilty, but not before.

"MORE LIGHT."

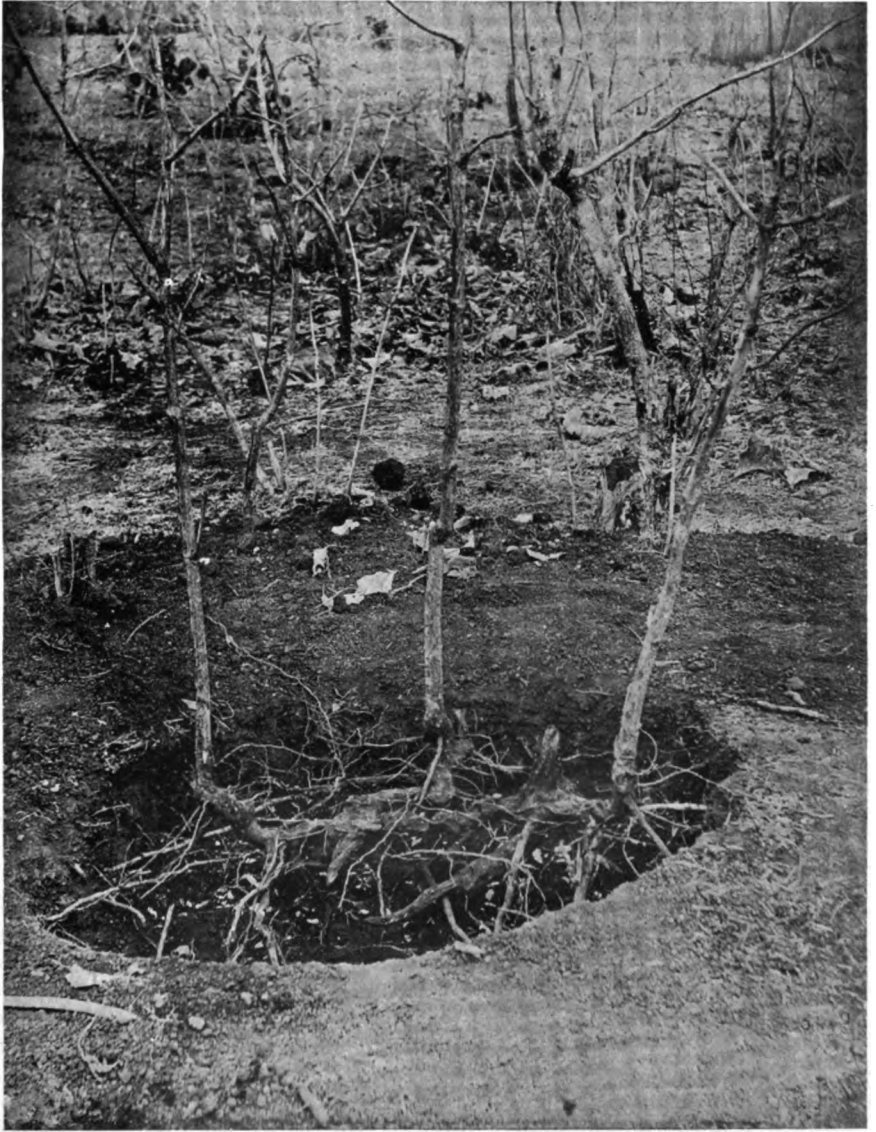
### Reproduction by Root Suckers.

I was much interested in Mr. A. W. Lushington's article on the subject of reproduction by root suckers or sucker shoots as he terms them, which appeared in "The Indian Forester" for April, especially as this is a subject that has been engaging my attention for some time; and I quite agree with him when he says "It is rather surprising how little attention is paid to the subject and that it does not appear to have met with as much recognition as it would seem to deserve."

This interesting mode of reproduction first attracted my notice some years ago when serving in Upper Sind, and in writing the Administration Report of that Province for the year 1893-94 (reviewed in the "Indian Forester," pp. 56-63, Vol. XXII) opportunity was taken to allude to it in the case of *Populus Euphratica*.

In this instance the reproduction in the alluvial plains of Sind was distinctly a benefit, both natural and artificial regeneration from seed of this species being obstructed from some cause or other, at least such was the experience acquired at that period. In the case of several species in the Thana district, however, reproduction does not possess the same value. Many species throw up abortive shoots only from their roots, while others instead of proving beneficial by the possession of this aptitude seem to be distinct hindrances to the natural regeneration from seed of more valuable trees.

In connection with *Populus Euphratica* the Conservator of Forests in Sind once directed the firing of a portion of the Kudrapur Forest in Upper Sind in order to give a spur to the reproduction from root suckers of this species, and the measure as far as my recollection goes was a distinct success.



**TEAK REPRODUCTION BY ROOTSUCKERS.**



The heat caused by the burning of the grass it was found stimulated the subterranean buds into activity just as it does in the case of the rhizomes and roots of some strong grasses and weeds.

It was not an uncommon occurrence to find numerous suckers 30 feet distant from the parent tree after a fire in the riverain areas in Upper Sind, all of which ultimately acquired a separate and independent existence by the decay and death of the original connecting roots, and a gregarious forest of *Populus Euphratica* was the result. Somewhat similar stimulus to the buds on the roots has been observed in the case of *Diospyrus melanoxylon* under the same conditions in Thana in parts of the Mokahada Range, and a most interesting and remarkable instance of such reproduction was brought to the notice of Mr. Duxbury, Working Plans Officer, recently on what is known as the Awlmatha near Suryawal in Mokhada. To a casual observer here the reproduction might have been thought to be from seed. Such it was declared to be in fact by the local patel and Forest subordinates when first it was observed, but excavations were made for their benefit, and the root system of the younger suckers exposed.

The following, excluding herbaceous species, have up to date been noted in Thana as producing root suckers :—

Teak.  
*Dalbergia latifolia*.  
*Ougeinia dalbergioides*.  
*Albezzia lebbek*.  
*Albizzia melanoxylon*.  
*Schleichera trijuga*.  
*Schrebera swietenoides*.  
*Trewia nudiflora*.  
*Pongamia glabra*.  
*Garuga pinnata*.  
*Butea frondosa*.  
*Randia dumentorum*.  
*Aegle marmelos*.  
*Croton oblongifolius*.  
*Ficus hispida*.  
*Randia uliginosa*.  
*Holarrhena antidysenterica*.  
*Helicteres isora*.  
*Vitex negundo*.  
*Calycopteris floribanda* (climber).  
*Combretum ovalifolium* (climber).  
*Schrebera swietenoides*.

Teak reproduction from root suckers is most interesting in parts of the Thana district. Near the town of Wada in Central Thana an area outside forest proper is covered with teak coppice shoots and also root suckers. The latter are much smaller than



the coppice, and in many instances resemble seedlings.\* In traversing this area I was struck with the abundance of such reproduction, and dug up the root system of some apparent seedlings to make sure. The accompanying photograph is one taken in this area exhibiting the root systems of three teak shoots which are connected and which originally resembled independent seedlings. In their case the connecting subterranean roots are still visible, but in the case of older shoots these connecting links as it were, like the poplar in Sind, entirely disappear, and this is the case with most species, so that when digging up the soil in search of root suckers one must not be disappointed in the case of older stems to find no connecting subterranean links at all.

In Europe the Aspen (*Populus tremula*) and the tree of Heaven (*Ailanthus glandulosa*) and some others† are known to reproduce themselves by means of root suckers, and the buds on the roots of these are stimulated to throw up roots apparently either by the mutilation of the aerial portion of the stem or exposure of some of the root system or by the trees having become decrepit with age. The latter stimulus has been noticed in Thana in the case of—

*Schrebera Swietenoides*, *Albizia procera*, *Dalbergia latifolia*, *Pongamia glabra* and *Schleichera trijuga*.

An interesting instance of reproduction owing to declining age in the case of *Schrebera Swietenoides* may be seen near Parali in the Wada taluka of Central Thana‡ where four large stems (girths 2', 1', 1' 4" and 1' 4") and two smaller ones a few feet high stand in a circle around the parent bole at a distance of 9 to 10 feet from it, and with regard to the other species instances are common especially in the hilly forests in the Bassein Range which skirt the sea coast. And this reminds me to remark that conditions of climate and soil have a varying effect on the powers of reproduction of a tree from root suckers. Relative abundance of humidity in the atmosphere for instance seems to provoke reproduction in the case of *Dalbergia latifolia*§ whereas the very opposite effect seems to follow under the same conditions in the case of *Schrebera Swietenoides*, that is to say, *Dalbergia latifolia* has been observed to exhibit a greater tendency to throw up root suckers in a relatively moist than dry climate, and *Schleichera trijuga* exhibits such increased tendency in a dry atmosphere only. And with regard to soil it can be readily understood that where this is soft less obstruction is caused to lateral expansion of the roots and the

\* In coupe No. 6, Block XVII of Wada, I ordered the subordinates to make an enumeration of the number of teak seedlings of 12-inch girth and under in the area (42 acres), which they did, and to my surprise over one thousand were reported to exist. On inspecting the coupe, however, the apparent seedlings were dug up and found to be none other than root suckers.

† Kerner in his "Natural History of Plants."

‡ Block No. XXIV, coupe 22.

§ Other species such as *Holarrhena antidysenterica*, etc., are similarly affected.

greater development in this direction takes place, so that when any stimulus is given to the buds from any external cause, such as shock caused by heat or injury to an exposed root, increased reproduction by means of root suckers is apparent in such causes,

*Avicennia officinalis*, which grows along the muddy tidal banks of the Konkan creeks, spreads its roots laterally below the surface of the soil in all directions, and although numerous buds exist on these roots, and although the resulting shoots therefrom are as dense almost as a field crop in some instances, none of the shoots develop any foliage. They become rigid and seem to perform the function of producing air passages to the roots for the moist clayey soil being impervious to air.

No means of respiration for the roots would result otherwise, and the *vicennia* would probably be suffocated.

The most prolific instances of reproduction from root suckers observed inside and outside forest are of *Holarrhena antidysenterica*, *Trewia nudiflora*, *Helicteres isora* and *Randia uliginosa*, and their reproduction in this manner may be characterised as being distinct hindrances to the natural regeneration from seed of other valuable timber species in the localities they inhabit. None of the above species is prized for its timber, and their reproduction in this manner is so abundant, especially when their aerial portions have been mutilated (as is always the case in the coppice-with-standard system), that exclusion of more valuable species from seed results.

In some of the exploited coupes in the Bassein Range the intervening spaces between the standards in certain localities are almost entirely usurped by *Holarrhena*\* especially, and the reproduction increases in even greater ratio as the fellings or coppings of the species increase.

A very remarkable instance of reproduction from root suckers in the case of *Trewia nudiflora* is noticeable in Coupe No. 19, Block XIX, of Bassein, and it is worthy of record. A large part of the coupe on the flat consists of mature teak. In passing through this area the abundance of advance growth of *Trewia* under the teak (in a small area of a few acres) attracted my attention, and not being able to account for this I was induced to investigate the cause, and on digging up the roots of *Trewia* found the reproduction to be due to none other than root suckers. The roots of the *Trewia* formed a complete network underground, and their density naturally accounted for the exclusion of everything else except surface growth, such as grass and weeds. This was in an area where the mature crop consisted, it is estimated, of about 80 to 90 per cent teak. The reproduction of *Helicteres isora* is also another instance of similar remarkable reproduction. This is a shrub that is widely distributed in the

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\* Coupe 14, Block XIV, at Saticoli is a very good instance of this. Being only three miles from the Bassein Road Station, it is easily accessible for inspection.

Thana district and common in the seacoast talukas especially. Its bark is used, as is well known, for fibre. Hence it is a shrub which is invariably seen lopped, and the more its aerial portion is mutilated the greater is the stimulus afforded to the dormant subterranean buds.

On the eastern slopes of the forests below the Tungar Plateau in Bassein such reproduction on the soft laterite soil is most abundant. The buds on the roots of *Randia uliginosa* seem to be stimulated without any apparent injury to be aerial portion of the stem or injury to the roots. A great deal of reproduction of this species is apparent in the flat, fissured black soil areas in the Wada Taluka of Central Thana.

The necessary stimulus to the subterranean buds in this instance appears to be heat, due to the exposure of the root system caused by the cracks in the black soil.

*Albizzia lebbek* is not a tree which has been noticed to throw up root suckers habitually, but a very interesting instance of such reproduction occurring on the exposure of the root system came to my knowledge recently in the Wada Range, where 21 *Albizzia lebbek* suckers were observed in some excavated pits arising from roots which were imbedded to the depth of  $1\frac{1}{2}$  feet in the soil. A close examination proved that these suckers arose from a network of subterranean roots which spread out from an *Albizzia lebbek* 100 feet away.\*

Among the species in Thana observed so far whose reproduction from root suckers may be said to be advantageous in certain areas are *Dalbergia latifolia*, *Albizzia procera* and teak.

The two former species throw up such shoots when either the aerial portion of the stem has been mutilated or when an advanced age has been reached, and in the case of teak the reproduction is stimulated only when the aerial portion has been cut down and when the trees stand on a plot exposed to full illumination of the sun's rays. *Albizzia procera*, which usually seeds abundantly; does not reproduce itself well from seed. This may be due to a cause which I have not investigated, but probably to insect damage. Seeds of *Bauhinia recemosa*, *Albizzia lebbek* and certain other leguminous species have been found very extensively damaged in this way, and specimens of the injurious insects were sent to the Forest Entomologist for identification. Probably the failure of reproduction in the case of *Albizzia procera* may be due to some similar cause. Teak seed also is attacked by an insect which obstructs its reproduction. The damage to the seed from this insect appears to be

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\* The Aspen according to Kerner has been known to throw up root suckers 90 feet away from the parent tree. The *Albizzia* here alluded to may be seen in Coupe No. 14, Block XXIV, Wada Range, and will probably be open for inspection for many years to come, for beneath it stands a Hindu deity (*Vagoba*), which will prevent it being felled or damaged.

general all over Thana and amounts to about 60 per cent of the tree growth in most localities and from 5 to 90 per cent per tree.\*

So far observations do not show that Babul (*Acacia arabica*) reproduces itself in Thana by means of root suckers, nor has this been observed to be the case with this species in Sind, where it forms large gregarious forests, aggregating about 65,000 acres. This was the approximate area under Babul in Sind about ten years ago, but it may have altered since owing to the eccentricities of the Indus, which sometimes erodes hundreds of acres of forest land in a flood season. Nor does Babul coppice, at least not in the ordinary silvicultural acceptance of the term, in Sind and the Thana district, at any rate. Some young stems when cut have been known to throw up abortive coppice shoots, but marketable coppice in Sind and in Thana would be considered a remarkable phenomenon.† Enough has been said to show that the interesting subject of reproduction from root suckers in the Thana district is one which ought to engage, as Mr. Lushington has remarked, the attention of Forest Officers. That it is one cause for the hindrance to natural reproduction of more valuable species such as teak in some of the Thana coupes, in the hilly forests especially along the sea coast, is beyond doubt, as I have attempted to show. On the other hand, in other areas more inland where teak and other growth have been once exploited and where the former has coppiced its regeneration from root suckers at the same time cannot be said to be but advantageous. The direct causes which bring about this result, as already explained, seem to be first of all shock due to the felling of the aerial portion of the stem and complete exposure of the surrounding soil caused by the previous removal of all jungle wood species,‡ but as such silvicultural conditions do not always prevail within forest limits the phenomenon is not constantly observable in such limits.

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\* In some cases while the tests were being taken trees were found to bear no seed at all. The experimental tests were not taken on a very large scale, only 24 trees being examined at haphazard as I marched through the forests. It will be found however, it is thought, that the percentage of damage is a fair average, and that it is general all over the districts there is little doubt. From what the people say moreover the insect attacks are annual.

† I am aware that in Guntur, *vide* page 256, Vol. XXI, of the "Indian Forester," babul is found to coppice there. In Mr. Ribbentrop's Note also on the Babul Plantation at Abbaspur, page 136, Vol. XXVI, he states "a coppice growth of several rotations might be expected." He suggested in the Note the publication of details bearing on the behaviour of the root system of this plant in the "Indian Forester." but I have not seen any subsequent report on the subject.

‡ In the Thana district almost everywhere the villagers are permitted to fell and remove in the wooded areas held in occupancy by them all trees, etc., except teak and *Dalbergia latifolia*, and in some places *Ougeinia dalbergioides*; so that where these fellings have been carried out teak reproduction from seed and coppice and root suckers is very materially assisted.

In mixed forest with a relatively dense leaf canopy, for instance, where the soil is comparatively cool such reproduction has not been observed. Another important feature though of such regeneration is that it seems to occur where the ground is bouldery and at the same time porous beneath. The root suckers, however, never appear to be at a greater distance from the parent bole than 3 to 5 feet; whereas in the other species such as *Albizzia lebbek*, *Albizzia procera*, etc., the distance, as already stated, is considerable.

In the discussion on the subject of teak natural regeneration in "The Indian Forester," which I have read with much interest, the hindrance to such reproduction from insect enemies has not, as far as I am aware, been recorded, and it would be interesting to know whether similar obstruction is caused elsewhere in either India or Burma. It appears to me to be a factor in the situation in Thana which must be taken into serious consideration. The wild tribes in the district I find are fully alive to the damage caused by the insects to the seed, which they have informed me bore into the seed during the monsoon when it has become well soaked. But I have detected insect damage to seeds collected from the trees, so that this is not altogether correct.\* Mr. Duxbury informs me that coupe contractors have told him that "the teak seed is seen damaged on the tree when soft and succulent, and that they considered, like the mango, that the life-history of the insect has some connection with the flower before it was fertilized."

Endeavours are being made to try and secure specimens of the insect, which will be sent to Mr. Stebbing if obtained.

Infertility of seed obtained from coppice stems in the exploited coupes is found to be another cause for the failure of natural reproduction of teak. It is true the coppice has not yet reached more than 15 years at most, but it is important to record that experiments to cause germination of seed from such growth so far have been in progress since September 1903, but without successful results.

Mr. Burkill, Reporter on Economic Products to the Government of India, very kindly undertook such experiments for me, and his last report, dated 14th June 1904, bearing on the subject, it may be interesting to record, is as follows:—

"The experiments on teak seeds have never been interrupted. Since September last the 100 seeds have stood on the tile always moist, but not one has germinated. The flesh outside the stone is black and rotted and moulds are growing on it sparingly. I have just cracked open ten fruits. Out of the possible 40 seeds in them three seemed possibly alive, very wet and damp. Out of ten fruits which have been dry all this time I got some five or six healthy seeds."

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\* Mr. Bhadbhude, Ranger of Wada, was the first Forest Officer to observe the damage to the seeds while on the trees.

I have observed teak coppice bearing seed at eight years, and as this seed is probably often collected by Forest guards for broad-casting it can be easily understood why such attempts at artificial regeneration of this species, added to the other hindrances remarked on, fails.

There is of course some natural regeneration from seed of teak in certain areas in Thana, but not by any means sufficient in far the majority of instances, it is alleged, to secure the future of the forests for the production of teak on a satisfactory scale.

In this view I am corroborated by Mr. Wroughton, who, in the Northern Circle Annual Report for Bombay for 1894-95, which was reviewed in the "Indian Forester," page 389, Volume XXIII, wrote as follows\* :—

"The 'coupe' system, as it is popularly called, under which the Thana forests are being worked, is in most ways a complete success. The people are furnished with raw-material and a livelihood and the revenue remains at a high figure; moreover, the coppice shoots from stools felled promise a fair crop for the next revolution, but it cannot be overlooked that there is a great dearth—too often a total absence—of seedlings to replace the present stools when their reproductive power shall be exhausted. The vitality of the present stools may last out two or even three revolutions, but unless seedlings are produced to replace them as they fail, the ultimate result must be denudation."

Being in charge of the Central Thana Forest Division, my remarks in this note of course must be taken to allude especially to that division, but it is believed they would be applicable generally, like Mr. Wroughton's remarks, to the other two divisions of the Thana district.

It is but right to mention in conclusion that my observations about the alleged unsatisfactory condition in Thana as regards teak regeneration from seed † are not borne out by such authorities as the present Conservator, Mr. Millett, nor by the two Divisional Officers of North and South Thana, Messrs. Fisher and Madan, and I am induced to think that perhaps where they observed an abundance of advance growth of teak in the exploited coupes of their division it may have been root suckers which were seen and not teak seedlings. Mr. Fisher in fact has informed me that most of the teak reproduction he observed in North Thana was mainly in the exploited coupes, and that very frequently the young teak has been seen growing in groups and as if burnt back more than once by forest fires, which would tend to indicate root-sucker reproduction.

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\* Mr. Wroughton attributes the failure of natural regeneration from seed to forest fires, and although he does not differentiate between teak and jungle wood species, his remarks are intended to apply no doubt more especially to teak, which is the main source of wealth of the Thana forests.

† Natural regeneration from seed of jungle wood species is in my opinion generally satisfactory in Thana; in fact in instances it tends to suppress the teak.

In addition to the hindrances to teak natural regeneration from seed which I have quoted, there are of course other causes at work in the same direction unfortunately which are too numerous and lengthy to enter into it in a paper of this description, which was intended originally to record observations bearing on root-sucker reproduction. I have however, as it is, much exceeded the limits of the subject, and seek indulgence on this score.

G. M. RYAN.

### **Notes from the Federated Malay States.**

As it is probable that little is known in India regarding the forests of the Federated Malay States, and as they present many features of peculiar interest to the Forester, I have attempted a short account, in which I have tried to explain the chief difficulties met with, in the hope that Forest Officers who have had experience in evergreen forests at all resembling those of the F. M. S. will be induced to give their opinions and suggestions on the subject.

We have to do here with dense evergreen forest containing comparatively few valuable timber species with badly proportioned age classes, very difficult transport, an immense demand for timber and firewood in the tin mines, and last and worst of all the Chinese cooly, who seems made to invent ingenious ways of evading Forest Laws.

The Federated Malay State consists of the four States of Perak, Selangor, Negri Sembilan, and Pahang, having a total area of 27,027 square miles, the vast majority of which is forest covered. Until comparatively recently the Malay population was small and scattered and the amount of cultivated land negligible, but since British influence has appeared on the scene, with consequent safety to life and property, tin mining has made enormous strides, so that at the present time these States are supplying more than half the total output of tin of the whole world. Consequently the floating population is very great, and consists as far as mining goes of Chinese of various denominations. The Chinese mining population at present is estimated at 202,000.

About 5 per cent of this population cut timber all the year round for the mines, and anyone acquainted with the processes of alluvial tin mining will know that pumping engines consume a vast amount of firewood, and unfortunately do not seem to be made to burn soft and useless woods, but hard and valuable kinds.

It is estimated that each man cuts about 10 tons a month. In this country the miners are allowed to cut and use timber of all but the most valuable kinds for consumption in their mines, free of royalty and without license, but as this means that a very large amount of timber and firewood is used for which the Government gets no direct return, they have agreed that part of the import duty on opium be credited to the Forest Department.

This agreement is an excellent one, as it would be almost an impossibility to collect royalty on timber and firewood going to mines scattered in hundreds all over the country, frequently with the worst means of communication possible. Most of the mines are open workings, but deep mines are on the increase, and in these the very best procurable timber is required for shafting.

Besides the demand for mines, there is a good demand by the more permanent population, but it must always be remembered that this population is drawn to the country indirectly by tin, and that if tin gives out here, it is very doubtful if the forest or any other department could pay its way, for some time to come. Agriculture is fortunately coming to the front, and may in time become of paramount importance, more especially the cultivation of Para rubber.

The next largest demand on timber comes from the Railway, which now procures all its sleepers in this country, using *Balanocarpus maximus* and "*Azelia palembanica*," both very fine timbers.

2. Having attempted to give some idea of the demands on the forests, I will try to describe the forests and their resources. The natural orders most strongly represented by useful trees are the Dipterocarpaceæ genera—*Shorea*, *Hopea*, *Dipterocarpus* and *Balanocarpus*; these supply most of the valuable timbers. Leguminosæ genera—*Parkia*, *Koompassia*, *Dialum*, and *Azelia*, Sapotaceæ genera—*Palaquium* and *Payena*, the Guttapercha-producing trees.

Laurinæa genera, *Litsea*, *Cryptocarya*, and others.  
Guttiferæa genera, *Garcinia*, *Callophyllum*.

There are also many rubber-producing trees, the best, *Ficus Elastica*, being found indigenous in small quantities, while climbers such as *Willoughbia* and *Urceola* (Apocinaceæ) are very common, and produce a rubber valued at about £10 per pikul (approx. 133 pounds, in Singapore). *Dyera costulata* (Jelutong) yields an inferior rubber, with very poor elasticity, much used in the adulteration of guttapercha. Passing over the consideration of these products however and coming to timbers, we may divide the forests into two main divisions—

(1) The dense evergreen mixed forests, containing the timber and guttapercha trees.

(2) The mangrove swamp forests, along the sea coast, and on the islands close to the shore.

As the problem of how to deal with the latter is comparatively simple, the crop consisting of but few species ("*Rhizophora*," "*Bruguiera*," "*Sonneratia*") which can be treated by the clear-felling system, I do not intend to discuss these forests at length, but I may mention that working plans are being drawn up for the supply of firewood to the Government Railways, and for public consumption.



To return to the evergreen forests, two timber trees stand out as pre-eminent, the first, *Afzelia palembanica* (Merbau), a magnificent hard wood tree with a very ornamental grain, which may almost be said to equal teak wood for furniture. The other is *Balanocarpus maximus*, a still larger tree. I have measured one in Perak 210 feet in height, and am sure I have seen many larger. A girth of 18 to 20 feet is not uncommon. Both are fairly widely distributed, and are to be found anywhere except in the swamps or above 2,000 feet, but the great demand and difficulty of transport has made it hard to obtain these timbers, and the price has risen in consequence.

3. *Balanocarpus* appears in most places to produce itself very slowly, and the following results may be looked on as alarming, and the remedy difficult to devise:—

	Area in acres.	I Class above 6 ft. girth.	II Class 4—6 ft. girth.	Under 4 ft.	Stumps.
<i>Balanocarpus</i>	925.	317	56	152	284
<i>Afzelia</i> ...	6.8	163	26	12	16

These countings were made along a chained line straight through the forest good and bad indiscriminately. The large trees must be of great age, nearly all the first class being over 12 feet in girth and several 20 feet in girth, and it is known that neither species are fast growers. Established seedlings are rarely to be found, even near the parent trees, but this is not from want of seed, as will be shown later on. The above countings must not be taken as typical in the case of *Afzelia*, the reproduction of which is as a rule fairly good.

It is interesting to note that I and several other Forest Officers who have served in the Upper Chindwin division in Burma have found teak growing in evergreen forest, and that in that case too the trees were large and solitary, being scattered about the area, the second and lower girth classes being very poorly represented, and natural reproduction at a standstill. Some have tried to account for this by the supposition that at the time when these teak trees were seedlings, the forest was dry and deciduous, and that through some cause or other fires had become rare in such areas, then ceased altogether, resulting in a gradual increase of the evergreen oaks and other trees found in the sub-evergreen forests of the Chindwin. I think this theory is borne out by the fact that where the forest was burnt deciduous forest very full of young teak was seen close to evergreen. I do not think this theory can be applied to this country, the probability being that evergreen forests have existed here for ages.

4. To understand this state of affairs it is necessary to have a clear idea of the general constitution and stocking of the forests. The average forest is stocked with an undergrowth consisting of a vast number of evergreen shrubs and trees, of all sizes up to about 60 or 80 feet high, densely packed, more or less taking the place of the bamboo undergrowth in a Burma forest. The density of this undergrowth is, however, far greater than anything I have ever met with in Burma, and from countings made in Malacca the average number of trees (dicotyledons) under 6 feet and over 18 inches in girth, is about 115 to the acre. Besides these are innumerable palms, canes, etc. Of the smaller a very common one is *Licuala*, "*Palas*," from one species of which are made the famous Penang lawyer, *Drymophloeus*, *Caryota mitis*, and a good many others. Of the larger Monocotyledons are "*Nibong*" (*Occonosperma Filamentosa*) found in damp localities, the wood of which is split and used for flooring. *Ohorrida*, "*Bayas*," with softer wood, *Livistonia Kingii* and *Arenga*, both of which are useful. There are also several species of *Pandanus* (*Menkuang*), bamboos are not numerous, and when compared with Burma forests, these may be called rarities. Large patches occur, however, especially in country which has been cleared by hill tribes, and on steep banks near streams. They are found more often on hills, and in many plain forests are not to be seen for miles. The commonest species are, *Schizostachium latifolium* and *Gigantochloa latispiculata*; and *Dendrocalamus Gigantea*, the giant "*Wa-bo*" of Tavoy and Mergui, found in Perak, and several species of *Bambusa*. Among these and a host of more or less valueless trees and towering above them are the big timber trees, of which the following are some of the most important, omitting those valuable species already referred to, "*Rengas*" (*Melanorrhoea Curtisii*), "*Resak*" (*Shorea barbata*), "*Tembusu*" (*Fagroea fragrans*), "*Tampinis*" (*Sloetia sideroxylon*), "*Petaling*" (*Ochanostachys amentacea*), "*Minyak-Keruing*" (*Dipterocarpus crinitus*), several species of "*Merantis*," which are all of the general *Hopen* or *Shorea*, e. g., *S. acuminata*, *S. Parviflora*, *H. Griffithiana*; "*Bintangor*," *Callophyllum spectabile*, and *inopyllum*, "*Kranji*," *Dialium laurinum* "*Kulim*" *Scorodocarpus borneensis*, and "*Sclimban*" *Shorea glauca*.

From countings made in Malacca forests it would appear that these large trees averaging about 7 or 8 feet in girth occur about 9 to the acre. In most places humus lies to a considerable depth on the ground, and needless to say there are no forest fires. The rainfall is distributed more or less evenly throughout the year and averages well over 100 inches, in some places 200 or more. Careful inspection of seedlings of *Balanocarpus* found growing under the parent trees in Pahang showed that these seedlings were just passing out of the first or cotyledon stage. Their tap roots had not penetrated to the

soil, but had attempted to reach it through the thick layer of humus; in a slightly more advanced stage they were found to be dying for want of nutriment, the tap root having failed to reach the soil before the reserve material in the cotyledons had become exhausted. The few seedlings which do establish themselves are quite able to hold their own.

Mr. Craddock, lately Forest Officer in Pahang, considers that the great number of very large trees points to the existence of different conditions at the time these trees were going through their struggle for existence. This theory is worth consideration and study, but I am under the impression that the reproduction of these species has always been slow in this locality, hence the great age of the trees with few connecting links.

5. The main question is, what is the best way of encouraging the reproduction of the valuable species? Artificial reproduction may be left out of consideration as far as regular plantations go, as the cost of clearing is prohibitive and these species do not grow well in the open, with a few exceptions.

Cleared land in this country if not constantly kept clean becomes covered with "Lalang" (*Imperata cylindrica*), the "Thetke" grass of Burma, but this grass here grows with such strength as to prevent young trees from taking hold. It is liable to fires and is benefited by them, so much so that in large "Lalang" wastes that are regularly burnt over, it is doubtful if natural reafforestation would ever occur. The cost of regular plantations is increased enormously owing to the necessity of most thorough cleaning. Again both *Azelia* and *Balanocarpus* are shade bearers, and when planted in the open it is found that they bend over and become sickly.

Planting out in lines cleared in the undergrowth is good, and is being done with *Palaquium* (the guttapercha tree).

All the trees we wish to reproduce are of course shade bearers *par excellence*.

6. As there are no definite seasons in this country, growth may be said to be never ceasing in the Malayan trees, and there are no true annual rings in the timber. It follows that there is no reliable information to be had as regards the rate of growth. From what one can learn growth is rather quicker here than in India, doubtless owing to the absence of a season of rest. At the same time the best trees cannot be said to be fast growers, and their timbers are all heavy and close grained.

As already shown, the demand for hard wood timbers is very great, and the Department is face to face with the problem of how to maintain a sustained yield of the valuable hard woods, in the face of an increased demand from the mining community, and others attracted to the country in the wake of the mining industry. Most of these look on restriction and regulation of the amount of timber to be cut as wholly unnecessary, and as unwarrantable interference on the part of the Forest Department, and

they believe timber to be inexhaustible. It is very hard for the average man who is not acquainted with the contents of the forests to believe that a country like this is not full of the best timbers; they forget that if there are one or two large trees per acre and of the best species that we must consider it good forest; and that in any forest where Chinamen have been working hardly one tree will be left. In addition to this an immense amount of the so-called forest here consists of secondary growth, containing nothing but the most useless species. Again, a very large percentage of our forests are inaccessible. At present our energies are concentrated on the task of constituting reserved forests. The only regulation outside reserves is that no trees may be cut if of less girth than six feet at six feet from the ground.

Suggested methods of improving present conditions are—

- (1) Preservation of parent trees in reserves.
- (2) Scraping off the humus so as to expose the soil here and there under and near such trees.
- (3) Improvement fellings.
- (4) Formation of nurseries of the valuable species in partial shade in the forest and planting out in lines cut through the dense undergrowth, at intervals of about 40 feet, the lines being about 50 feet apart.

In these notes I have purposely omitted the discussion of the best methods of treating our valuable gutta percha (Plaquium and Payena) trees, as I hope to discuss this at some other time, and to send photographs when I have collected more information and statistics. This branch presents but few difficulties.

This part of the world is well worth a visit from Indian Forest Officers, differing as it does in climate, flora, and fauna from most parts of India. The main roads are magnificent, and there is a motor car service running regularly for long distances, traversing the main range dividing Pahang from Selangor State and crossing a gap in the watershed 2,700 ft. in height. As is probably well known by this time in India, Para rubber cultivation here is on the high road to success, and Plaquium can be seen in its original home.

As regards game, although there is abundance of bison and rhinoceros, they are difficult to come upon in these dense forests, and good trackers are scarce. As compared with Indian shooting it may be considered as very poor.

A. M. BURN-MURDOCH,

*Conservator of Forests, F. M. S. & S. S.*

### Old Cooper's Hill.

Peculiar, if somewhat sad, interest was attached to the meeting of Old Cooper's Hillians at dinner on July 13th last, for it was the first assembly after receipt of the mournful news that the Old College had heard its death-knell, had received its *coup de grâce*, and knew that its days were numbered. *Sic transit gloria mundi!*

The dinner, arranged by Messrs. W. H. Cole and A. Hicks, was all that could be desired, and was discussed with zest by a party of between 60 and 70 men, O. C. H's, and their guests. As one glanced round the tables one could not but silently agree with a remark, made later on in the evening by General Edgecombe, on the youthful look of the greater majority of those present, a youthfulness not due so much to age of the men (for the seniors were in great force), but undoubtedly more particularly attributable to the active life which the performance of their duties, entailed upon the greater number of those present. There are some who say that health in India is to be sought by taking the minimum, the irreducible minimum, amount of exercise whilst serving in the country. Could they have seen Cooper's Hill the other evening they would have seen that a hard active life appears to suit the men from the College on the Hill marvellously well.

The Chair was taken by C. Perrin (1874), the chief guests being Major-General Edgecombe, R. E., Professor H. McLeod, F.R.S., and Colonel J. Pennycuik, C. S. I., with Messrs. J. S. Beresford, C.I.E., J. H. Glass, C.I.E., Mr. G. Chesney, &c.

After the toast 'The King-Emperor' had been duly honoured, S. Debrath (1877) proposed Cooper's Hill in a speech studiously moderate in its language. Indeed this was the predominant note of the evening, and should prove, if proof at all were necessary, that such an Institution as the College is the ideal at which to aim to ensure the proper training of its future officers; for at it they learn three important things—never to be forgotten in after service—*esprit de corps*, discipline, and loyalty to the Government they serve. In spite of the surprise, the sorrow, the irritation, to call it by no worse name, with which the recent order has been received throughout the rank and file of Cooper's Hill men, all of which feelings could not but be perceivable the other evening, those three fine qualities, *esprit de corps*, discipline and loyalty, were not for a moment forgotten. It was an object-lesson, and an object-lesson of which any Government might have felt proud to find in a body of its servants.

The speeches were optimistic and pessimistic, and perhaps, as was only natural, the optimists were to be found among the ranks of the younger orators. Both Debrath and F. Rawson, C.M.G. (1878) were optimists, and, on the principle of never saying die until you are an inanimate corpse, they held that with two years in hand, with Governments and Secretaries of State who have both been known to change at times, both occasionally suffering the fate of more lowly mortals, the ignominious one of being 'kicked'

out; and, above all with a Viceroy who is known to possess both a strong will and great tenacity; counting over all, these points our optimists sounded the note of hopefulness and inclined to doubt that the curtain would be rung down in the near future on as grand an institution as Government have ever planned and reared. Amongst the pessimists were Colonel Pennycuik and Mr. Chesney. The former, whilst saying that it was the dearest wish of his heart to see Cooper's Hill kept on, could not see his way to holding out any hope that this would be the case. It was easy to see from the Colonel's speech and those made by General Edgecombe and Professor McLeod (both the latter of whom were on the Staff at its inauguration) what a great hold the College has upon the affections of them all. Love for the *alma mater* was much *en evidence* throughout the evening. I have said that Mr. Chesney was a pessimist, and sorry many of us were to hear that he was so, for the *Pioneer* has ever been a faithful friend to Cooper's Hill. In a lengthy and highly interesting speech Mr. Chesney gave reasons for considering, for fearing, that Cooper's Hill was doomed, interspersing his remarks with anecdotes of the days when his father was the first President of the College, for the present undoubted pitch of perfection of which we owe to the great administrative qualities of the man who was its founder. In the course of his speech Mr. Chesney, who may be said to represent outside public opinion on the recent decision, showed that that opinion coincided closely with that of the services affected by the coming change. Letters regretting their inability to be present were received from Sir John Otley, K.C.I.E., Dr. Schlich, C.I.E., F.R.S., &c., whose absence was not perhaps, under the circumstances, surprising.

A wish was expressed before the assembly closed that, whatever the eventual fate of the College, the Cooper's Hill Dinner might be continued for many years to come, and that the Cooper's Hill *esprit de corps* might grow the stronger as years rolled on. One can but re-echo the wish. F. J. Branthwaite, B. O. Coventry, F. H. Todd, and the writer were the Foresters present.

E. P. STEBBING.

### **Bassia latifolia and Bassia longifolia.**

Although Mhowra seed is being exploited in parts of the Central Provinces and parts of the United Provinces, it is necessary to point out that this produce is not forest produce under section 2 [2] (a) and (b) of the Indian Forest Act. It is, as will be seen by a reference to the Act, omitted from mention among the various articles enumerated therein. Mhowra flowers are mentioned only in the section. Would it not be desirable to amend the Forest Act under the circumstances?

Owing to certain representations made on the subject of the market value of Mhowra seed, the Bombay Government were

induced to order the Departmental collection of it in Thana; this season. Unfortunately, however, the locusts, which were a perfect plague almost all over the district during the dry season, defoliated the Mhowra trees more than once in some instances, and prevented the flowering of the tree.

Those trees which escaped defoliation or were only partially defoliated, flowered and seeded but scantily, due to a profuse flowering and seeding of the trees the previous year. The exploitation of the seed will probably be undertaken next season (1905)

The question arises whether *Bassia longifolia* seeds should not be exploited as well as *Bassia latifolia*. This question has been raised by Mr. Cowley-Brown, who points out that *Bassia longifolia* and *Bassia latifolia* bulk very largely in the Nallamalai forest of the Kurnul district, Northern Circle, Madras, a block of 2,000 square miles of forests.

Sir Dietrich Brandis in his "Flora of N.-W. and Central India," page 291, mentions that from *Bassia longifolia* seeds oil is extracted, and in a small work by F. N. Mukerji of Calcutta entitled "Handbook of Indian Products" it is stated—

"The oil obtained from the seeds is used as a lamp oil, in the manufacture of country soap, and as a substitute for ghi (clarified butter) and cocoanut oil in cooking curries and making sweet cakes. Dr. Balfour states that the seeds contained about 30 per cent oil."

*Bassia longifolia* is not found in the Thana district, and as I have never seen the seeds and know nothing about them I am unable to give an opinion as to their value for export purposes; but it seems if the seeds are not now exported from any locality, as is probable, it might be advantageous to encourage the export of the produce by making an experimental shipment of say a ton, in order to test its market value. This is suggested since the seeds from *Bassia latifolia* appear to be inadequate to meet the existing demand, judging by information to hand from merchants in Bombay, and probably as far as merchantable requirements go, *Bassia longifolia* and *Bassia latifolia* seeds are very similar.

In parts of the Central Provinces the Commissioner of Settlements and Agriculture, Mr. Sly, I. C. S., has brought to notice the fact of the absence of natural reproduction of *Bassia latifolia*, and also the danger of the early extinction of the mature trees there, owing to the attacks of the *Loranthus* parasites. In view of the great value of the Mhowra flowers as an article of food he states that the future outlook of the tree is serious, and he seeks for information as to the best means to arrest the latter damage. I have supplied, through Mr. Lawrence, I. C. S., the Director of Agriculture, Bombay, whatever information I possess on the subject, but probably there are other Forest Officers who can also give more useful information, and Mr. Sly I have no doubt will be obliged for any hints.

It was suggested to Mr. Lawrence that the waste lands in the Bombay Presidency might be rendered productive by the artificial reproduction of Mhowra in the Mhowra-producing tracts, and although he approached certain Collectors and the Commissioner of Customs and Abkari, Bombay, on the subject, they were one and all averse to the proposal because the Commissioner of Customs and Abkari writes "So long as the principal use of the products of the Mhowra tree is the manufacture of liquor, any extension of the growth of the tree should be discouraged," and that the only tracts in which it should be permitted to grow are "large, concentrated, thinly populated blocks of forest."

It may be interesting to mention that Mr. Hudson, I. C. S., Collector of the Kaira district, Guzerat, in writing to me on the subject of Mhowra says, "There are thousands and thousands of Mhowra in this district. ... The oil expressed from the seed is used locally at Kapadwanj for soap making. There is a press worked by an engine at Thasra, which sends the oil inland to Balasiner and the Rewa-Kanta State as well as by rail."

I suggest that the market value of Mhowra seed be quoted by the "Tropical Agriculturist" along with the other articles of minor products which that periodical quotes monthly and which is reproduced in the "Indian Forester" for information.

BANDRA :

G. M. RYAN.

10th August 1904.

## II.—CORRESPONDENCE.

### On Certain Important Forest Questions.

The reproduction of teak on areas capable of producing this species depends, firstly, on the proper exposure of the seed to heat. Secondly, on the presence of sufficient suitable mineral matter in the surface soil. The amount of light overhead only comes in afterwards as a factor of importance. Before we have the young tree we must get the seed to germinate.

East of the Chinduri River on evergreen areas the soil, though frequently suitable for teak of medium quality, does not often allow it to germinate though it comes up thick in the sandy beds of the Chourys,—the Naurapet and Palin chourys for instance, subsequently to become hollow. West of the Chinduri in the true teak forests the evergreens and the dense growth confine it principally to the upper spurs and saddle-backs.

With the exception of the alluvial sandy loams, where it is found with Pyinkado, etc., growing to a large size, but much injured by those same fires which alone have enabled it to grow in such areas, the teak, in such parts of Burma as I have seen, is confined to the poorer and more mineral soils. As in the North Canara teak forests, so in Burma, if we omit the alluvial areas, teak grows best where it is scarcest, and *vice versa*.



There can hardly be a better illustration of this than that obtained by taking a section more or less west to east across Canara from the tall teak of the Gund plateau 130 feet in height, and tracing the growth across towards the east. Passing the rich semi-evergreen Viranpali forest, where even *Grewia tilifolia* is over 90 feet, and crossing the Birchi-Dardelli rich teak forest, teak becomes more and more plentiful till we end up in the pure teak forests 50ft. to 60ft. height extending from north of Singhatgerri southwards. There too pure teak forests have been more burnt than the western forests which sometimes escaped in part. The eastern portions were most carefully burnt by the graziers from the plains, in order to make the grass grow, and they were not partially protected by belts of evergreen or moist stream beds like the western parts. The seed in the eastern portions gets much more baked than that in the west. It always reaches the mineral soil readily. But one tree from the west is worth several from the east.

Similarly we find in the Kolabad and Thana districts of Bombay the teak growing most abundantly over most of the more open and grassy areas. It is the only tree left in many cases. Here again we occasionally find rich valleys with an odd large teak tree, but reproduction is nearly impossible owing to the absence of one or both of the two essential conditions mentioned above.

Provided there is mineral soil of suitable ingredients in the teak zone, it does not matter where, at sea level or at 4,000 feet, whether the rainfall be 100 inches or 25 inches, the teak comes up. It grows in patches not only on alluvial soil, but on arid rocks throughout the extensive Seshachellams and the Palakondas, and on high hills on the border of the Mysore plateau in the dry Cuddapah district of the Madras Presidency. It is found on the west coast of Bombay in company with *Sterculias* on arid cliffs, where its leaves fall early in October. It is unnecessary to dwell on the fact that it comes up like a weed on fire lines which are well burnt in Tennasserim and elsewhere, and that both in India and in Burma it comes up well in open areas where the soil is disturbed by cattle.

For anyone who cares to go to Burma there is no more easily got at place than the Magayi teak plantation. About the year 1898 or 1899 a "yâ" plantation was made about  $\frac{1}{4}$  or  $\frac{1}{2}$  mile north-east of Kimpadi rest-house on the slopes of the Choung. It was cut and burnt too late, so that only parts burnt properly. It had been very heavy soft wood jungle. Those parts which had burnt properly were successful. Where the burning was badly done the seed failed, and the area had to be planted with seedlings from the auxiliary seed bed. In such situations incompletely burnt yâs will not do.

North of the same Choung in the (1873?) plantation is an area unplanted. It contains several largish teak trees.

Though the paddy fields in the neighbourhood are infested with young teak, and the fire lines and the burnt wooded area outside them show copious reproduction, this old protected area which has been continuously and successfully protected for 30 years, does not contain a young tree. Here at all events we can point to a long and well protected area where the teak has been protected out of existence.

One of the peculiarities of forest fires is that they alter the distribution and degree of abundance of different species. In the Cuddapah district whereas on Redwood areas it has destroyed most of nearly every other species but this valuable Redwood (*Pterocarpus santalinus*), on the other hand it has (with the aid of the "selection" system turned a valuable forest of *Shorea tumbuggiana* into a next to useless scrub of *Eugenia alternifolia*.

But if we have forest fires to thank for the wide distribution of teak, we also must remember that those fires now go on over areas where they are no longer needed, and are yearly impoverishing the soil and reducing good forest to the condition of the eastern forests of North Canara, and the upper spurs of the Okkan Reserve in Rangoon division. Then again forest fires are in themselves such imperfect machines. Their effect is greatest where they are least needed, while there are enormous areas annually burnt over with next to no improvement in teak reproduction owing to the density of the cover and the want of light. Fires merely damage these areas uselessly as they also damage "Eng-dine."

If we look at the financial aspect of protection, bearing in mind that only a portion of the area reported as "saved" is really saved, we find that while the tabulated results are somewhat disappointing taking India and Burma as a whole, both Conservators and Divisional Forest Officers are careful to distinguish between the small areas reported as burnt and the very much larger areas actually burnt. If we are to have really good fire protection, it will be a very expensive operation. As it is the large additions made in the way of Deputy Rangers and Foresters, not to mention the time taken up by the District Forest Officer, is not debited to fire protection, and its real cost is thus not given. In short, in the tabular statement the full cost is not given, while the results are exaggerated.

From a practical point of view it is to be observed that there are areas which under existing circumstances cannot be continuously successfully protected. When a man insists on burning a forest, and has an unlimited number of ways to escape by, and it takes many hours, perhaps days, to get men together to put it out, the area will be burnt. Similarly where the grass is luxuriant no man can face a fire. There is a limit to fire tracing, which is reached when labour is no longer obtainable, and when the cost becomes prohibitive. Then again with the cheapest and best of arrangements, the villagers light fires on purpose, so as

to be paid for putting them out again. If not paid, they take care to burn more.

One great disadvantage of fire protection is that the longer we put off the fire, the fiercer it is when it comes. I have seen the outside area, burnt in February, clothed with a nice covering of leaves in April, and saved from being burnt by the fire from the protected area by those same well kept lines which were supposed to guard the latter. These early fires do perhaps a quarter of the damage done by late fires. Even when the area again burns in about April the fire is feeble and large portions escape. In this way many seedlings escape injury, a certain amount of vegetable manure is annually insured, while the ashes, which are so good for teak reproduction, are also obtained.

We know that perfect fire protection means complete annihilation to the young teak in the richer forest of Burma. We know that it is extremely unlikely that we shall ever get very good results under the present system of no compromise. We do not extend the area attempted very much as the cost would be prohibitive, and a large extension of the area attempted would mean certain disaster, as the "buffer state" now burnt by us would cease to exist. Why not introduce a system of compromise under which it would be extremely difficult not to save much of the little now burnt, and at the same time favour the most valuable species, instead of trying to confine it to the less fertile hill spurs?

25th July 1904.

C. M. HODGSON.

## Fire Protection in the Teak Forests of Burma.

### I.

Mr. S. Carr can well look after himself, but as he is away on leave, will you let me answer "Non Burman" for him. Two of his statements are challenged. Let me deal with the second first—"Most of us have suffered considerably in recent years owing to the number of senior officers leaving been transferred from India."

"Non-Burman" seems to think the transfer of Messrs. Graddon, Muriel, Jackson, and Carr far more than counterbalances this. Of the above four Messrs. Muriel and Jackson are the only real Burma officers. Mr. E. C. Carr for the first seven years of his service held such important Burma posts as Changa Manga, Multan, Rawalpindi, Phillour and Lahore, and then as 3rd grade Deputy, Mandalay Direction.

Mr. Graddon's record as a Burma officer is still more instructive—joined the service December 1885; appears first in Burma November 1901 as 3rd grade Deputy.

Again, of the next four quoted only Messrs. Thompson and Burn-Murdoch are Burma men.

Mr. Hill joined the service in December 1887; appears in Burma in January 1896. Similarly Mr. Hodgson joins in December 1890; appears in Mandalay in 1897.

Mr. Manson came to Burma as Officiating Conservator, so he didn't help us much in the way of promotion. But to show Mr. S Carr is right, what of Messrs. Jellicoe, Reuther, Anthony, Rind, Leete and Ker Edie, to only mention some I can call to mind.

A senior man coming to Burma keeps us out of promotion, and after having blocked us for some years, it is really very consoling to be told he has been made a Conservator, or "it's all right; we have taken a Burma man away" when he goes at last.

2. As regards the fire protection question "Non-Burman" says his "remarks must not be taken to apply to areas where there is bamboo undergrowth in teak forests."

In Upper Burma I think most Burma officers of experience asked to estimate the classes of teak forest roughly would say that teak and bamboo covered 80 per cent of the area, 18 per cent teak and evergreen and 2 per cent teak without either (I only refer to forests containing teak at all). Non-Burman ignores the first, but that is the only class we Burma Forest officers need bother about. As regards the teak and evergreen that is naturally fire protected and the teak is surely dying out therein; the teak forest without bamboos or evergreen is so small as to be hardly worth troubling about, though I may here say that such is usually outside protected areas and is annually run through by fierce fires, yet such areas look like very fine plantations, the teak being tall and straight and reproduction excellent; but such areas depend on peculiar factors of soil only found locally and no amount of fire protection will increase them, or is one of the miracles expected of successful and continuous fire protection—the turning of laterite into alluvial?

3. Might I in conclusion ask "Non-Burman" to be sure of his facts before giving us dissertations at all.

"TAW KWE."

## II.

I see from the "Indian Forester" for August that Mr. Long desires some one to check his mathematics.

As I have just had occasion to deal with a similar problem in my Annual Report for 1903-04, and the solution is quite simple, I send him the correct answer to his problem. It is Rs. 1,14,333.

$$R^T - 1$$

The formula is  $A = P.R. \frac{R^T - 1}{R - 1}$

$$R - 1$$

Where  $A$  = Amount at the end of the period.

$P$  = Annual expenditure.

1 or  $R$  = Amount of Re. 1 at the end of one year.

$T$  = Number of years.

$R$  = Rate of Interest.

SEONI-CHAPPARA :  
6th August 1904.

N. C. M.

### Canadian Forestry Association.

I have received a Circular from the Honorary Secretary of the Canadian Forestry Association with a view to increasing the membership of that body, widening its sphere of influence, and collecting and disseminating such information as will enable its membership and the general public to appreciate and understand the Forestry problems which are presented for solution in Canada. The objects of the Association are—

“The preservation of the forests for their influence on climate, fertility and water supply; the exploration of the public domain, and the reservation for timber production of lands unsuited for agriculture; the promotion of judicious methods in dealing with forests and woodlands; reforestation where advisable; tree planting on the plains and on streets and highways; the collection and dissemination of information bearing on the forestry problem in general.”

It need hardly be said that the forest question is really acute in Canada, not less than in the United States, and it is a sign of its importance and of the awakening interest that the C. F. A., though only established five years ago, already has some three to four hundred members, including many of the best-known names among lumbermen, officials, both of the forests and other branches of the Administration, and persons less directly interested in the subject. Without offence to these fellow Imperialists of ours, it may be said that the scientific side in the Association is weak. Organisation and protection have been begun in Canada, but other branches are practically unknown or unpractised.

Forestry in democratic countries of great forests is not and never will be run on the same lines as in India, but the general scientific principles remain the same; and officers of the Indian Service who can extend their sympathy across the seas, and particularly those who have time and opportunity to visit Canada, will have an interest added to the daily round of life in this country, and at the same time will be doing the Empire a service by placing their professional knowledge in touch with Canada and in some degree helping to fill the vacancy indicated above.

The annual fee of membership is \$ 1-0-0 and fee for life membership \$ 10-0-0.

I shall be glad to forward the names of any persons wishing to join the Association to the Honorary Secretary in Ottawa.

LANSDOWNE.

R. C. MILWARD.

### The Necessity for Fire Protection.

There seem to be a good many opinions in favour of abolishing fire protection in the Teak Forests of Burma, and some very good reasons are given. It probably has not been recognized by many outside Burma what *their* fires consist of;

for a jungle fire in these parts generally does assume proportions more like the American forest fire instead of being a creeping ground fire as Mr. Carter puts it. I have seen saplings in the Nallamalais of Kurnool, of which the age—counted by the rings on the stump left—was 10 to 12 years old, burnt to within a foot of the ground; and in the same locality I saw a *Sterculia* tree burn gradually down to the ground, beginning with its smaller branches from 30 to 40 feet off the ground. The sound of these fires can be heard for miles, and smuts from them are conveyed to Nandyal, 15 to 20 miles off. I presume that in such circumstances it could hardly be advocated that fire protection is unnecessary.

The fact of the matter is that there is a sort of idea prevailing that what is essential in one place must be essential in another; an attempt to fit the cork of a large bottle into a very small bottle, and *vice versa*. A great deal of money may possibly be wasted over fire protection in some localities when there is a crying need for funds for the same in other localities.

WALTAIR :  
7th August 1904.

A. W. LUSHINGTON.

### A New Termite in India.

In the September number of the *Indian Forester* I have read an interesting note upon the subject of a new species of termite which, according to Mr. Radcliffe, was found by Mr. Wroughton in Kashmir last year and sent by the latter for identification to the well-known specialist in the group, M. Desneux. The latter very courteously honoured the sender of the specimens by naming the insect *wroughtoni*. May I enquire what Mr. Radcliffe intends to convey by his statement "M. Desneux had unwittingly named the species after Mr. Wroughton, but this *will now be altered*!" The italics are mine. May I ask what is Mr. Radcliffe's authority for calling the species '*radcliffei*?' A species once described and named is named for all time, provided the specific name attached to it has not been previously used for another species in the genus, and even if the describer were to change a name, already given by him to a species, scientists would pay no attention to the alteration unless there were very grave reasons for it. Without a hard and fast rule of this nature it would be impossible to work at all; and I can only surmise that it is simply from ignorance that Mr. Radcliffe has acted in a manner which cannot but appear most discourteous to a distinguished foreigner and scientist.

In this particular instance your correspondent has not even the plea that he himself discovered and took the specimens sent to M. Desneux. What does he say? On his own showing it was only that he told Mr. Wroughton where to find the insect or an insect like it. A very different thing! He further states

that he sent some identical specimens to the Editor of the *Indian Forester*, several years ago. Since neither Mr. Radcliffe nor the Editor were, I believe, specialists in the group, it is not possible to make such a statement. The termites he sent may have had a similar appearance to *Termopsis wroughtoni*, but no one laying claim to the most elementary scientific knowledge would consider that sufficient to entitle him to rank as the discoverer of the species. Does Mr. Radcliffe imagine that we know all the termites of Kashmir? It would be a pleasant thought!

I would like to encroach upon your valuable space and make one other observation. Your correspondent appears to be labouring under the delusion that if a new species of plant or animal is discovered by himself, it should *ipso facto* bear his name. This is a fallacy as erroneous as it is common. Many describers refuse, except in very exceptional circumstances, to name a species after either its collector, its forwarder, or anyone else. They, and many think quite rightly, prefer that its specific name should either describe some very prominent characteristic or denote the locality from which it was taken. Others would only commemorate in the particular group or family the names of men who have actually devoted themselves and their work to it.

Whatever course the actual describer of the species may think fit to take, it should be borne in mind that he is conveying a favour, a very great favour, upon the discoverer of a new species by placing at the latter's disposal his special knowledge—a knowledge only acquired, probably, as the result of a life's work. Such being the case, criticism of his work can scarcely be deemed courteous.

E. P. STEBBING.

### **The Review of Forest Administration in British India 1901-02.**

The letter by "Your Reviewer," which appears in the August number of the "*Forester*" decides the question as to the meaning which it was intended to convey by certain parts of your January article on Indian Forest Administration in 1901-02. The Forest Administration of the Central Provinces was not attacked unjustly, the Government of India was not patronised: your article conveyed instructions to all Forest Officers, not to those of the Central Provinces alone. Perhaps one may even hope that the article was characterised by a becoming spirit of modesty, and by a feeling of kindness towards the shortcomings of others.

I hasten to express my regret at the failure to understand your reviewer's English, which led me to trespass unnecessarily on your valuable space.

C. P. FISHER.

NAGPUR:  
5th August 1904.

## III.—OFFICIAL PAPERS AND INTELLIGENCE.

**Report on the Rubber of *Rhynchodia Wallichii* from Burma.**

By Professor WYNDHAM R. DUNSTAN, M. A., F. R. S., Director.

This sample of rubber, Register No. 19779, prepared from *Rhynchodia Wallichii* in Shwegyin, Tenasserim, Burma, was forwarded to the Imperial Institute for chemical examination and commercial valuation by the Reporter on Economic Products and is referred to in Letters No. 2721-32 F. S., of the 26th August 1903, and No. 154-32 F. S., of the 18th January 1904.

Several notices have recently appeared regarding the rubber-yielding properties of this plant, which is reported to be fairly common in the Pegu Division, and the rubber obtained from it has been described as of good quality.

The sample received for examination consisted of an irregular cake, weighing 48 grams, which was slightly mouldy on the surface. The rubber was dark brown throughout and contained a small amount of vegetable matter. Its physical properties were very satisfactory, it being quite free from stickiness and exhibiting good elasticity and tenacity.

The rubber had the following composition:—

	Sample as received, per cent.	Calculated for dry material, per cent.
Moisture	2.8	...
Caoutchouc	86.5	89.6
Resin	6.5	6.7
Dirt	4.2	4.3
Ash included in dirt	0.48	0.51

These results show that this specimen of the rubber of *Rhynchodia Wallichii* is of good quality, as the dry material contains 89 per cent of true caoutchouc and only 6.7 per cent of resin. It may be noted that a small amount, about 1.5 per cent, of the caoutchouc was insoluble in the usual solvents.

The rubber was submitted to brokers for commercial valuation, and they report that at the present time consignments of similar quality would sell readily in the London market at about 3s. 6d. per lb. This valuation, it must be noted, is based upon the high prices which are at present ruling in the rubber market, Para rubber being 4s. 8d. per lb. on the day upon which the valuation was obtained, so that the price mentioned will represent rather more than the normal value of the rubber. There is no doubt, however, that the rubber of *Rhynchodia Wallichii*, if of similar quality to the present sample, would always sell readily and command a good price in the market. The plant is reported to be common in certain districts of Burma, and it therefore appears to be worthy of attention as a possible source of rubber.

WYNDHAM R. DUNSTAN.

IMPERIAL INSTITUTE, LONDON.

20th May 1904.



**Lindera Aromatica, Brandis.**

Extract from Letter, dated the 31st March 1904, from Sir D. Brandis to F. B. Manson, Esq., Conservator of Forests, Tenasserim Circle.

I also send a note regarding a most remarkable shrub, not uncommon in Martaban and Tenasserim, so aromatic that the dried fruit and possibly also the leaves may have a future commercially.

Perhaps you could get copies and translations made of this note for circulation among your officers in order to enable them to collect specimens, in the first instance to make sure that they have the right species.

(True Extract.)

*Karaway*, Burmese; *Laion*, Karen, an exceedingly aromatic shrub, the fruit of exceedingly pleasant taste. The fruit is sold. I found it first early in 1859 on the Taipo mountain, south-east of Toungoo, at about 4,000 feet. In April of the same year I found it in fruit on the D'onat range between Thaungyin and Haundraw, and have a full description of it written at the time in my notes. I found it a third time in February 1880, on the hills East of Toungoo at an elevation of 2,000 feet. At that time it was covered with white flower-heads. The leaves are *lanceolate*, the blade 2—3, the petiole slender  $\frac{3}{4}$  inch long. Male and female flowers are on different bushes. The male flower-heads, on slender stalks  $\frac{1}{4}$  inch long, are about  $\frac{1}{4}$  inch in diameter, and each head contains 5 small flowers, enclosed in bud, by large involucre bracts.

This shrub is very similar to *Lindera assamica*, *Kurz*, sent to me by Mr. Smales from Upper Burma, and to *Lindera citriodora*, *Hemsley*, an exceedingly fragrant shrub of Japan, Formosa and China, and should, with a few others, be placed in a separate genus, the anthers of which are in some species 4-celled, in others 2-celled. It has been suggested to me that the leaves and the fruit of *Lindera aromatica* might possibly be of great value in the Perfumery trade; hence a supply of the dried fruit and of the leaves might be useful. First, however, it would be necessary to make sure of the species; specimens, therefore, in flower and fruit should be sent to me in the first instance. The following are the three closely allied genera of *Lauraceæ*:—

1. *Litsæa*, Anthers 4-celled.
2. *Lindera*, Do. 2-celled.
3. New genus anthers 4-celled, *L. Aromatica* Fl. with the leaves, *L. citriodora* Fl. when shrub is leafless.\*

Anthers 2-celled *L. Assamica* Fl. 10—15 in each head.

Kew, March 1904.

D. BRANDIS.

Fl. 5 in each head.

## V.—SHIKAR AND TRAVEL.

**The Distribution of the Hog-deer (*Cervus porcinus*).**

In the article by Mr. Stebbing, on Captain Forsyth and the Highlands of Central India, attention is drawn to the alleged fact, that Captain Forsyth found the hog-deer in the eastern parts of the Central Provinces. Some doubt still exists as to whether this animal is found in the Central Provinces or not, and it would be interesting, both to scientists and to sportsmen, if the distribution of this deer were settled once for all. The latest authorities on the subject (Blandford and Lydekker) consider that the occurrence of this deer in the Central Provinces requires confirmation, and it would seem that the possibility of its occurrence in the Central Provinces has been based on Captain Forsyth's assertion alone. It is probable, however, that he was mistaken, or possibly the deer may have been exterminated since, although this is extremely unlikely. It has always struck me as curious that this deer did not occur in the grass lands of the Central Province sal forests; nevertheless I have not only never seen anything like it, but have never met anyone who has.

If any officers who have had experience of the Bilaspur, Raipur and Sambalpur districts would give their opinions on the matter, this question could be definitely settled.

‘SOLID LEAD.’

**A New Disease in Coorg.**

An epidemic, which has caused many deaths amongst wild elephants, bison, sambur, spotted deer and cattle, has been prevalent not only in South Coorg, but in the adjoining Mysore and Malabar forests. So far no one has been able to say what the disease is, it being very infectious and fatal. The main symptoms are fever and developed buboes, and the animals attacked die within a very short time after the first appearance of illness. This disease is reported to have been observed in Wynnad (Malabar) in May last. It spread to South Coorg in June and last month to Tarikere taluq, Kadur district, Mysore State, where seven head of Amrut Mahal cattle are reported to have died with the symptoms described above. As far as I have been able to ascertain wild elephants have not been known to have been subject to any epidemic in the past, at any rate in this part of India. It would be interesting to know what the disease is, and if it has been observed in other parts of India or Burma.

SOUTH COORG :  
14th August 1904.

A. M. MASCARENHAS,  
*Extra Assistant Conservator of Forests.*

## VI.—EXTRACTS, NOTES AND QUERIES.

**The Forest Academy of Tharandt.\***

BY G. CADELL, late Indian Forest Department.

## THE CROWN FORESTS OF SAXONY.

Before entering more immediately upon the subject of this paper it is advisable to consider what interests are involved in the healthy activity of this Academy; for it is the pivot on which turns the judicious administration of the forest wealth of a kingdom in which rather more than one acre out of every four is underwood, yielding a direct return of vital importance, and contributing in no small degree to the general prosperity. The Crown Forests of Saxony are stated, on competent authority, to produce a net revenue of over 22s. per acre per annum, and at the same time to be in a highly prosperous condition as regards their permanent or capital value. To make a proper comparison of this return with that derived from agricultural lands, two all-important facts must not be lost sight of.

1st.—This revenue is obtained without any cost of exhaustion of the soil, and therefore without any necessity for its subsequent regeneration by chemical or other manures; and

2nd.—The capital, which in Forestry means the cubical contents of the timber crop, is yearly being added to by natural growth, and is consequently each year becoming more valuable.

And if we carry the comparison nearer home, there is yet another fact which makes the case for British Forestry still stronger, and that is, that in spite of our large imports from abroad, the price of timber in Great Britain is very much higher (perhaps it would not be unfair to say twice as much) than the prices obtained for similar wood in Germany. That these prices will show a tendency to rise and not to diminish in the future is a matter of common and reasonable expectation. So that it is possible, without undue exaggeration, to affirm that a revenue, largely exceeding what is above stated as now realised in Saxony, might be looked for from similar woods, when worked up to a similar standard of productiveness in Great Britain.

The employment given to the rural population by the tending and collection of the Forest revenue is an important factor common to both countries. What is more germane to our present subject is the part played by a fully-equipped Forest Academy in the building up and maintenance of the Forest capital.

## THE FOREST ACADEMY.

The Forest Academy of Tharandt, with which is inseparably connected the name of Baron Cotta, whose memory is kept alive by the eighty oak trees planted round his grave in the grounds

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\* From Notes of the Surveyors Institution.

by his former pupils, is about eight to nine miles distant from Dresden. For such a purpose its situation is most favourable. Upon this three closely-wooded valleys converge, with a considerable stream, affording all the facilities necessary for the carriage of the wood by water, and its conversion by saw mills. It possesses within its walls not only class-rooms, but large collections illustrative of the sciences principally taught, such as chemistry, zoology, botany, and general fruit products, the collection of forest seeds claiming to be the largest in Europe. Outside, there is a forest garden or nursery which will demand below more especial notice, and its domain includes a large area of forests both pure and mixed, which with outlying "Lehr-rivieres" or instruction woods, are under its sole management. It thus, besides being in itself an "imperium in imperio," forms a serious and valued branch of the State administration, and as such is placed under the Ministry of Finance. With a high prestige to be maintained, and with resources fully adequate to this maintenance, professors and students meet, with success in their studies already half achieved at the commencement. The prosecution of these is here a matter more of personal observation than of laborious committal to memory of hard axioms, involving often impossible, or at any rate unintelligible, conclusions. The science of Forestry is indeed present, but it shares with the practice the education of the Forester. How they go hand in hand towards the common object will be seen by the nature of the subjects taken up in the course of instruction.

#### THE COURSE OF STUDY.

This course extends over two and a half years (five half-years) beginning in October. In the winter session visits are paid under expert guidance to the various manufactories in the district, and in the summer there are botanical and zoological excursions, besides periodical inspections of the works under progress in the rivieres. The more strictly class-room course is divided into—

I—Grund wissenschaften, literally "Ground Sciences," the fuller meaning of which is elucidated by the following list:—

(a) Natural Sciences, including Organic and Inorganic Chemistry, Mineralogy, Geology, Knowledge of Soils, Botany (including the Anatomy and Physiology of plants, fungi, and general forest flora, Zoology (or the study of the Vertebrates and Insects), Experimental Physics and Meteorology;

(b) Mathematics, including Surveys and Plan-drawing, keeping of Accounts and Road-making.

II.—Fach wissenschaften, literally "Professional Sciences," under which are placed—

Forest Science generally, Forest Law, Forest Construction, Forest Protection, Forest Use (including the measurement of woodcrops and of timber), Forest Finance, Forest Regulation, Forest Administration, and Forest Policy.

III.—Hilf wissenschaften, literally "Auxiliary Sciences," which are considered to be,—Legal Knowledge, the Management of Land, and the various matters pertaining to hunting, shooting, fishing, &c.

These, it will be observed, are all subjects rather of the field than of the study, and where they are prosecuted indoors it is only with the view of their practical application outside.

#### THE FOREST NURSERY.

For such practical application the ground covered by the forest nursery, extending to 12 hectares (30 acres) gives ample scope. The specimen trees and plants are here arranged botanically, that is, according to their orders, the broad-leaved trees coming first and the needle-leaved trees occupying the higher ground. Thus all the trees of the "Quercus" tribe are marshalled together, so also with the "Abies" (Silver Fir), "Tanne" in German, the Picea 'Spruce', "Fichte" in German, &c. The Pinus Sylvestris (Kiefer), of which the German variety differs slightly in the colour of its wood from that raised in Great Britain, is specially prized and bears an excellent timber. The merits of the "Douglas," too, are fully recognised. Here, too, are specimens of trees which grow suspended in tubs containing only water, without any direct contact with the soil. These are nourished with "feeds" of chemical manures, the object being to illustrate to what a large extent trees, and indeed all plants, are dependent upon the atmosphere which they breathe for their life and growth. The most unhappy "subjects" at the date of my visit appeared to be the Himalayan "Silvers," Webbiana, &c., which have not as yet taken very kindly to their altered conditions of existence. As showing the universality of the interest taken in the collection, I may mention that I met, purely by accident, the Chief of the Bulgarian Forest Department, a former confrère at Paris in 1900, and an official of the Forest service in Java. The Director of the Academy (Dr. Neumeister) is *ex-officio* Keeper of the Royal Garden, and in it he has, if I may so call it, a most useful colleague. The natural "habitat" of trees, for example, has most intimately to be considered in their importation and acclimatisation. To take a similar instance, the cedar grown on Mount Lebanon bears a different quality of wood, and is in all respects a different tree from the cedar on a Surrey lawn; and for anyone who seeks to find in forestry the outcome of a successful financial enterprise, the knowledge of the altered conditions imposed by altered circumstances is most necessary. It is possible to predicate a fairly certain proposition regarding an indigenous tree; regarding an exotic it is not.

#### THE FOREST LIBRARY.

The extensive and valuable Forest library within the Academy building supplies to the student all information regarding trees

in their native habitats. In it and in the Herbarium he has the means of identifying and comparing the various subjects of his out-door examination. The books are also lent to outsiders accredited to the Director or otherwise vouched for. There is no space here for even a cursory enumeration of the books and manuscripts themselves, and I gladly avail myself of the excuse; for the feebleness of British Forestry is painfully exemplified by the small number of books in English, while other nationalities are fully represented. In Forest booklore, Germany is naturally facile princeps.

#### FEES PAYABLE AT THE ACADEMY.

Passing on to the cost of the education given at the Forest Academy, we shall find that, looking to the advantages for study, as given above, the fees payable are very moderate. They amount to only 225 marks per annum, payable half-yearly, together with a half-yearly subscription to the hospital of 15 marks additional; the whole cost may thus be placed at something under £ 12 a year for instruction. Board and lodging can be obtained in the village—for this is not a resident college—at the rate of 12,000 marks or £60 per annum; but of course the student is not in residence during the whole year. The cost of obtaining a certificate of proficiency in forestry, which can be secured by the diligent student within the two-and-a-half years' course, can thus be easily calculated. Less easy of calculation is the value of that certificate after it has been obtained, and the prospects of employment which it holds out.

It may here be noted that the openings in Saxony for such employment are very limited.

The proportion of wood in the country being so great, as above stated, every Saxon landowner is himself a forester, and he knows how to manage his woods, which, it must be remembered, have been handed down to him in a strict course of regulation, with the view not only of direct returns, but of their indirect value to his arable or pasture lands. The majority of the students at the Academy of Tharandt are therefore foreigners, who hope to find the market value of their forestal knowledge in their own or other countries. A countryman of our own, for example, has come over from New Zealand to study Forestry at Tharandt, with the view of applying his knowledge on his own land on his return to the Colony. The value of this Academy lies in the fact that no young Institution can hope to rival, in the immediate future, advantages which it offers. These have been the growth, under successive Directors, of well-nigh a century. A Forest Academy, like a Forest itself, requires time for its development and instructive usefulness. There are, further, several scholarships attached to the Academy, for the encouragement of successful students.

### THE TEACHING STAFF.

The success of all colleges and academies depends, in no small degree, not only upon the professional knowledge, but upon the personality of the members of the teaching staff. In such an academy as that of Tharandt, where there is such a variety for pursuits, and where professors and students are necessarily thrown into such intimate relations as these entail, there must be a community of tastes and sympathy in their prosecution. The discipline of the lecture room is relaxed in the practical work of pisciculture, for example, or in the chase. During the course of the daily excursions or the more extended tours taken in summer, circumstances arise when the resourcefulness of the student comes to the assistance of the knowledge of the professor.

Within doors also, the free interchange of thought is encouraged by the monthly discussions, or debates, which relieve the daily lectures. In such debates, which form part of the statutory course, the professor speaks no longer *ex cathedra*, but from a common platform with his students. Besides the Director, who himself delivers lectures, chiefly on Forest trees, there are two professors of Forestry. There are four professors of natural sciences, the scope of which has already been explained. Two professors for mathematics, and one for land surveying complete the teaching staff. The status of each of these is strictly defined, and his obligations to the State on the one hand and to his pupil on the other clearly indicated. Besides delivering lectures they have the custody of, and are required to keep up to date, the collections and museums illustrative of the subjects which are their peculiar charge. They attend also the sittings of the Law Courts when these are held at Tharandt and discuss with the students the arguments which are advanced on either side in the conduct of the cases. There is but little of the stereotyped pedagogue in the Tharandt professor.

### THE STUDENTS.

If the obligations of the professors to the students are thus clearly defined, so also are the obligations of the students to the professors. Many of the students are foreigners, for forestry at the teaching stage, as at all others, is independent of nationality. It is only required of those that they shall be able to follow the lectures, which are given, of course, in the vernacular. From all a certain standard of general knowledge is exacted before admission, and where the prospective pupils are minors, the written consent of their parents or guardians must first be obtained. In addition to the regularly enrolled students, outsiders may attend the lectures or join in the excursions, at the discretion of the Director. It is not necessary to give *in extenso* the regulations imposed upon the students for their general conduct.

That these should exist in written form is no doubt a necessity of the case, but when a young man reaches the age at which he may become a forestry student, written rules will not keep him straight if he chooses to run otherwise. For such there is no room at the Academy. There can be no advantage either to professor or to student in a course which ends in the finding "ungenügend," unsatisfactory=0 and a certificate marked "kaum genügend," fairly satisfactory=1 will be but of little assistance to its professor in his after-search for employment as a Forester. Good conduct and attention to discipline may therefore be confidently looked for in the forestry student at Tharandt.

The village, although boasting the usual Kurbad and mineral waters, has nothing in itself to distract the student. A ready market is found for all cut timber, and in the neighbouring small town of Rabenau there is a large manufactory of chairs, in which, as in Buckinghamshire, beechwood, which is here a natural product of the soil, is greatly used.

#### CHALLENGE TO GREAT BRITAIN.

In the nature of things, the existence of such a college as that of Tharandt is not possible in Great Britain in the immediate future, however ardently it might be desired. There is, however, no great evidence of this desire, if one may judge from what are called the "forstgartens," which it is proposed to attach to some of our agricultural colleges. It is not easy to guess what the object of these playthings is intended to be. The whole subject of Forestry in Great Britain is approached as cautiously as if it were a stinging nettle, and like the nettle it will resent the feebleness of the grasp extended to it. The complaint, which is really more an excuse than a complaint, made by successive administrations "that Forestry does not receive sufficient support from private proprietors, the class which should be most directly interested," covers less than half the truth. It may be granted, indeed, that practically the whole of the afforested area of Great Britain is in the hands of the private proprietors, and that the so-called Crown Forests are insignificant in extent, and still more insignificant from the view of their value as timber-producing properties. It is true, therefore, that they hold the key of the position, but it is also true that they are prevented from making use of it. If they are expected to enter upon such a permanent improvement as that of forestry, which benefits not only themselves, but the country generally, they have a right to demand that the State shall lead the way in the systematised management of woods, and that their work shall not be undertaken haphazard and in the dark. And they have the right, too, to demand that during all the period of their unrecuperative outlay, say, roughly 23 to 25 years, the lands they are afforesting shall be free from all taxation, including death and succession duties. In no other country but our own are the hands of the private proprietors thus



doubly tied: Those who still make their woods pay their way in Great Britain do so only under the most judicious administration, and in spite of, rather than by the help of, the treatment they receive from the Government. The generality of proprietors have, under present conditions, no choice but to prefer the rents which they can easily and at once obtain from sporting, to the postponed returns they may expect from woods. And so long as they maintain upon their properties such a proportion—a proportion far below that which is held to be judicious in Saxony under timber so as to give shelter to their flocks and herds—they will give preference to woodlands for coverts, our full and close grown crops of timber. Without unduly appreciating the home policy of other countries, to the depreciation of that pursued in our own, it is yet permissible to say that a clear challenge to take up the case of what is confessedly a neglected science in Great Britain comes from the Forest Academy of Tharandt.

### **The Timber Resources of European Russia.**

Of so much of the vast Empire of Russia as lies within the geographical confines of the continent of Europe, no less than 510,300,000 acres are forest land. The very magnitude of these figures hides their significance, and they become more intelligible if we say that they give an area of nearly five acres for every inhabitant. Of this great woodland area the State is the largest owner, possessing, after the exclusion of waste, no less than 234,900,000 acres. (We are dealing with the figures in respect of Russia in Europe alone.) Private individuals own 108,000,000 acres, and peasant communities 43,200,000 while 14,800,000 acres are under the administration of the Appanage Ministry. From its forests the Government derives a revenue of about seven millions per annum. The important share which the wood trade takes in the foreign commerce of European Russia may be gauged from the fact that the timber exported represents about 9 per cent. of the total exports.

So large a share of the national wealth is represented by forests that regulations for their protection were obviously required, and accordingly we find that so far back as the days of Peter the Great the wood-bearing areas of Russia have been subject to protective ordinances. By these laws the rights of private owners were originally considerably restricted, but in the reign of Catherine II were amended in a more liberal sense, since which it has been found necessary to place all forests, whether owned by the State or by private individuals, in certain matters under the control of the central authorities. The important place which forestry occupies among the administrative departments of the country may be gathered from the fact gleaned from a

recent Government publication from which other particulars here mentioned have also been obtained—that the staff of the “Liesno Department” in St. Petersburg and the provinces numbers more than 3,000 individuals.

One of the main objects of the forestry laws of Russia is the protection and creation of forests serving purposes of general public utility, such as consolidating shifting sands, protecting land from erosion by water, &c., or in the neighbourhood of sources of rivers and, therefore, contributing to the regular supply of water. Such forests are termed “protective,” and may not be disafforested. In considering the forest resources of Russia in reference to export capabilities, allowance must, of course, be made in respect of these “protective” areas; but, unfortunately, no figures appear to be available. Another important feature of the law is the creation in each government of a committee having for its object the conservation of forests. The composition of this committee is of a mixed character, comprising both officials and forest owners. It is the duty of the committee to decide what forests are to be declared “protective,” to put a stop to reckless or wasteful felling, to approve or modify plans of management which have been submitted by private owners, to exercise general supervision over all the forests of the district, and to institute legal proceedings against persons infringing the forest laws.

It should be noted that owners of forests desiring to make clearings in forest land must announce their intention to the committee, and if in six months no refusal has been received permission may be taken for granted, and the owner may begin cutting. Owners of forests not declared “protective” may draw up plans of management in accordance with certain regulations laid down, and if the plans are sanctioned the owner is not subject in the development of his timber to any other restrictions than those designated and sanctioned in his plan of management. The regulations provide that cycles of felling shall be for plantations of conifers not less than 40 years. In plantations of conifers with fir trees predominating, if among the latter there are not less than a thirtieth reproductive more or less regularly distributed over the area for cutting, the breadth of the annual felling is decided by the owner.—*Timber Trades Journal*.

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### Cooper's Hill.

The following official notification was issued on the 23rd June:—

The Secretary of State for India in Council has now arrived at a decision as to the date of closing the Royal Indian Engineering College at Cooper's Hill.

The Prospectus for 1904 states that the College will be permanently closed at the end of the Session of 1905-06, and that

the Entrance Examination to be held in July of this year, under the conditions explained in the Prospectus, will be the last.

It also states that from those passing the Entrance Examination, twenty-five appointments will be made in the Engineering Branch of the Public Works Department, one appointment in the Accounts Branch of the Department, and two appointments in the Telegraph Department.

Applications for admission to the Entrance Examination must be made in writing to the President of the College, on a printed form to be obtained from the Secretary to the College, on or before Friday, the 15th day of July next.

A further communication will be shortly made as to the future education of candidates for the Public Works and Telegraph Departments in India.

### A Student of Forestry.

*The Times of India.*—We are glad to record the return to India of Dr. Noshirvan Gustasp, an energetic and enterprising member of a Parsee family of Surat, who for some years past has been studying forestry in Europe. Dr. Gustasp appears to have an unusual bent for forest work, and in the course of an extremely creditable career has triumphed over many difficulties. He first studied at the Imperial Forest School at Dehra Dun, where after a two years' course he obtained a Forest Ranger's certificate. He then proceeded to Europe, and applied for leave to enter Cooper's Hill, but to his chagrin found that he was two months over the age-limit of twenty years. Full of disappointment, he returned to India, where he accidentally heard of the great forest schools of Germany. With commendable perseverance he went at once to Germany, spent six months in unremitting study of the German language, and then entered the Forest School at Tharandt, in Saxony. Two years later he passed the examination in forestry at that Institution. Afterwards he went to Giessen, the headquarters of the Forest School attached to the University of Hesse Darmstadt. There he studied for nearly four years more under some of the ablest of German forest experts, including Hess, Wirmenauer, Thaer, Albert, Hansen, and Sievers. Finally, early in the present year, he took his degree of Ph. D. at Giessen, his thesis being "On the Use of Underground Wood." Dr. Gustasp has now, on the completion of his training—which was watched with great interest by Sir Dietrich Brandis and other experts in Indian forestry—resumed residence in India. His great ambition is to find employment in the profession of his choice in his native Presidency. We trust that so admirable an example of perseverance in the face of many obstacles will be adequately recognised by Government, and that Dr. Gustasp will be accorded that opportunity of following his profession which his exceptional

training and his commendable enterprise render him worthy to receive. Such persistent endeavours on the part of a native of India, to qualify himself without any external assistance for a scientific calling demanding special knowledge, deserve warm encouragement.

## VII.—TIMBER AND PRODUCE TRADE.

### Churchill and Sim's Wood Circular.

1st July 1904.

**EAST INDIA TEAK.**—There is no change to report in this market. The deliveries for June were 1,568 loads as against 800 in June, 1903, making the deliveries for the first half of this year 5,382 loads, compared with 5,587 loads for the same half of 1903.

**ROSEWOOD—EAST INDIA.**—Really good logs from medium to large sizes sell well, but small inferior wood can only be placed at low rates.

**SATINWOOD—EAST INDIA.**—Some sales have been made at satisfactory prices, but the general demand is still quiet.

**EBONY—EAST INDIA.**—Stocks are ample and sales difficult.

### PRICE CURRENT.

Indian teak, logs,	per load	...	...	£9-15s. to £18
„ „ planks,	„	...	...	£12-5s. to £20
Rosewood,	per ton	...	...	£6 to £12
Satinwood,	per s. ft.	...	...	7d. to 18d.
Ebony,	per ton	...	...	£5 to £10

### Denny, Mott and Dickson, Limited.

#### WOOD MARKET REPORT.

London, 3rd August 1904.

**TEAK.**—The landings in the docks in London during June consisted of 233 loads of logs and 381 loads of planks and scantlings, or a total of 264 loads, as against 2,341 loads for the corresponding month of last year. The deliveries into consumption were 403 loads of logs and 213 loads of planks and scantlings—altogether 616 loads—as against 993 loads for July, 1903.

The Dock stocks at date analyse as follows :—

	5,857 loads of logs, as against	5,580 loads at the same date last year.
4,054	" planks	8,738
—	" blocks	—
Total	9,911 loads	9,318 loads

The above figures sufficiently show the inanimation of the market. Shipments continue to shrink, but still suffice to maintain stocks on a scale equal to the ever-shrinking demand. It is clear that the reduced stocks on the shipbuilding rivers look absurdly inadequate to meet any revival in the building of the class of ships which require teak; but any likelihood of such revival seems remote, as the supply of first-class tonnage afloat far exceeds the actual needs, although perhaps the over-supply is not so serious as in the case of the "tramp" description of tonnage. A resumption of shipbuilding on the scale of recent years is obviously unjustifiable, so that teak must increasingly depend for its outlet on the building of warships, the production of rolling-stock and the use of the wood in domestic architecture. The first outlet largely depends on political considerations, the second promises to be checked by the increased necessity for our Railways to cut down working expenses, and the third and the most recent outlet has been greatly restricted by the great rise in the cost of teak during the last two years. There seems no sound room for any reduction in present prices, seeing that the shipping ports are practically bare of stock; but if the expectation of very moderate new season's supplies from the Indian forests is made a ground for a further forcing up of f.o.b. prices, it is clear that the already rapidly developing tendency to displace teak by other material will receive a further impetus, and the use of teak for general constructive purposes will receive a check not to be overgot at the will of the shippers, should it suit them later on to try and revive the demand. War vessels may require all the teak that can be produced for Europe; but the example of Germany in discarding the use of teak for decks and other purposes is already being partially followed by our own and other Admiralties, and under the circumstances it would perhaps be wise for Indian foresters and shippers not to discourage the more commercial outlets for teak.

The tone of business during the past month has been a little less doleful under the influence of favourable weather for building operations and the subsidence of much of the "irresponsible chatter" caused by the increasing scrutiny of the security offered by those requiring financial facilities. The holiday season, however, has a slackening tendency, and the present political disquiet will also add to the disinclination to enter into anything more than the necessary hand-to-mouth business until the last quarter of the year, which will bring the necessity of deciding business on which the close of navigation has a serious bearing.

**Market Rates for Products.***Tropical Agriculturist, August 1st, 1904.*

Cardamoms	...	... per lb.	1s. 3d. to 1s. 5d.
Croton seeds	...	... „ cwt.	20s. to 25s. 6d.
Cutch	...	... „ „	22s. 6d. to 30s.
Gum Arabic	...	... „ „	15s. to 20s.
„ Kino	...	... „ lb.	2½d. to 6d.
India-rubber, Assam	...	... „ „	2s. 3d. to 4s. 1½d.
„ Burma	...	... „ „	2s. to 2s. 3½d.
Myrabolans, Madras	...	... „ cwt.	5s. to 6s.
„ Bombay	...	... „ „	4s. to 7s. 6d.
„ Jubbulpore	...	... „ „	4s. to 6s. 3d.
„ Bengal	...	... „ „	3s. 6d. to 5s.
Nux Vomica, Cochin	...	... „ „	8s. to 10s. 6d.
„ Bengal	...	... „ „	6s. 6d. to 8s. 6d.
Oil, Lemon grass	...	... „ lb.	7½d.
Orchella weed, Ceylon	...	... „ cwt.	10s. to 12½s.
Seedlac	...	... „ „	180s. to 200s.
Tamarind, Calcutta	...	... „ „	7s. to 9s.
„ Madras	...	... „ „	4s. 6d. to 6s.



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## Notice to Contributors.

Mr. E. P. STEBBING on his return from leave has resumed the Honorary Editorship of the *Indian Forester*, and all contributions should now be addressed to him at Dehra Dun, United Provinces.

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## Pioneers of Indian Forestry.

CAPT. FORSYTH AND THE HIGHLANDS OF CENTRAL INDIA.

By E. P. STEBBING.

It has been already pointed out that at the time the Central Provinces were constituted little was accurately known regarding the forest resources of their waste regions. It had indeed been suspected that the projectors of the railways had over-calculated the possible supply; but it was not guessed that the exhaustion had gone so far as really proved to be the case. The pernicious system of cultivation (*dhyu*-cultivation or *jhuming*) of the hill tribes was in itself almost sufficient to have proved the ruin of the forests, but other causes had also helped. The most valuable timbers for railway and other purposes were the teak and sal, no other having at that time been found to be really lasting when subjected to the great and sudden variations of the Indian climate. The teak was perhaps the most generally useful, and on it, where found, had fallen the weight of the people's requirements; and it is probably due solely to its valuable coppicing capabilities that it had survived at all in many areas. The coppice shoots grow in the course of a few years into large poles, and these formed the chief demand of villagers for the construction of the small houses in use in this part of India.

To this fact may perhaps be explained a moiety of the apathy with which native governments witnessed the wholesale destruction of their valuable forests to fill the pockets of the few. There was, however, at the time of the formation of the Central Provinces Administration a good deal still left in the remoter forests, where communications were not so easy; and the forests, if properly taken in hand, might have yielded a steady supply of large timber for many years. The fatal mistake was,



however, made of announcing that, *after a certain time*, the forests would be brought under Government management and strictly conserved. This was the death-blow to the remainder of the teak throughout the northern parts of the tract.

To any official with a few years' experience of district work it is hardly necessary to state the all too obvious result of this brilliant administrative order, surely the first Secretariat effort of a newly-joined griffin! The railway contractors, and numerous speculators, foreseeing the value timber was likely to acquire, owing to railway operations and the closing of the forests, went into the jungles with bags of rupees in their hands and spread them broadcast among the wild tribes with instructions to fell, fell, fell and spare not! One can picture the joy of those *junglis* and their astonishment at the permission, or rather order, given to them to go into the forest and carry on one of their favourite pursuits unchecked, *i.e.*, the indiscriminate cutting of fine trees. Who does not know their methods?—the careful selection of some giant of the forest, the careful training of it so that in its fall it may bring down as many neighbouring trees as possible and commit the maximum of destruction in the forest with the minimum of trouble to themselves. This prompt action on the part of the timber fraternity resulted in every teak tree larger than a sapling being laid low and marked with the contractor's own mark, and scarcely anything accessible escaped the axe. Such was the legacy left to the newly-formed Forest Department in this region, and surely no more onerous charge, none fraught with more exacting conditions and bitterer consequences, has ever had to be taken up. Simple is the destruction of a forest, but fraught with much difficulty is its reconstruction.

Following upon these wholesale felling operations came delay in the railway works, resulting in the failure of the contractors and want of money. The cut timber was abandoned wholesale where it lay. Teak wood is full of oil, and in the ensuing fire season large numbers of logs were burnt where they lay—a total loss. The exact amount of destruction will never be known. Forsyth states that for years afterwards when exploring the forests they continued to come upon the charred remains of these teak trees, numbers being quite immature and unfit for felling. All that were worth anything were saved by the Department in after years, and the value, even of these, amounted to many lakhs of rupees. They were not, however, a hundredth part of those that were cut, the number of which should probably be reckoned by millions rather than thousands. It is still most doubtful whether the injury done to the forest and to the country by this most mistaken measure will ever be fully recovered; and it certainly furnishes a most valuable object-lesson to such of our Colonies, and to America, where acts of a similar nature are still being carried out. The history of the last thirty

years' work of the Central Provinces Forest Administration in these areas should prove instructive reading for them, and would well repay the study. *Verb. sup.* Such was one of the most material results of the utter ignorance of the administrative officers of that period regarding everything connected with the wilder portions of their charge. The mischief had been completed, and most of the timber speculators had bolted from their creditors, leaving their logs smoking in the forests, before the formation of the Central Provinces Administration and ere the Forest Department had entered on its work of exploring and arranging for the protection of what was still worth looking after.

That the same fate did not overtake the Sal forests was due chiefly to the preference exhibited for the teak, to the greater difficulty in felling the sal tree, and chiefly to its greater inaccessibility from the populous regions, the nearest point at which any great supply could be had for the railway being about a hundred miles by a bad land route. Forsyth stated that up to 1870 this had proved an insurmountable obstacle to the general utilisation of this timber on railway works. We perhaps should not be inclined to agree with his statement that the supply is inexhaustible, for the inevitable contractor has practically cleared all sizable (and many unsizable) trees from most of the Central India Native States since his day, and the Government forests in parts have been considerably worked. Our Pioneer's note on communications reads like an extract from a present-day Annual Report, or review on such. We read "a stronger commentary on the commercial value of easy communications could not be found than this, that the railways have found it cheaper to import pine sleepers from Norway, and iron-wood from Australia, than to carry the sal timber growing within a hundred miles of their line. There is something wrong where this is the case, and that something is the want of a good road into the sal regions from the railway at Jubbulpore, which road should have been made, for many other reasons besides this, long ago." This was in the sixties. Forsyth did not here mean that the Forest Department was responsible for the absence of the road or that it should be made by them. Thirty years later, in the nineties, had Forsyth toured round India he would have found many similar cases. The Bengal-Nagpur line running through the Chota Nagpur Government sal areas is sleepersed with iron pot sleepers, the E. I. Railway is sleepersed with sal it is true, but, until within the last few years, sal chiefly from Native States cut *à la* Central Provinces teak model of the sixties; the Assam-Bengal sleepersed in many parts with pyinkadu from Arakhan on the same principle the reason usually having been due to want of adequate provincial communications. Since those days it has, we think, become recognised that the building and up keep of the main roads of a district, even where they run through great forest regions, does not fall within the province

of this Department, the latter being solely responsible for the feeder roads, tramways, etc., which will enable it to get out its produce on to the main arteries of the district. In the absence of the latter it becomes very difficult for the Local Forest Officials to compete with imported foreign timber.

Forsyth was to commence his work in the Pachmarhi hills, the lofty block crowning the Satpura Range to the south of the Nerbada River. Here the centre of the operations in this extensive forest region was fixed, and a permanent forest rest-house at what is now the headquarter station of Pachmarhi was to be built in the heart of the country of the Gonds and Korkus, whose interests were, if possible, to be united with those of the newly-constituted department in the preservation of the remnants of the fine forests which had once clothed the slopes of their hills. As has been said, this rough country was little known, and its exploration meant hard work and constant exposure—the only abode a small pal tent. Those were not the days of the 12-mile a day stage on a good road with a fine bungalow at each end, and yet to those who still consider that mud huts are all that are required in camp, it might be pointed out that the sudden termination of such a valuable life as that of Forsyth's, unavoidable perhaps in those days but none the less a severe loss to his Government, was due to what is nowadays unwarrantable and unnecessary exposure. It can scarcely be gainsaid that the value of a senior man's work must depend to a great extent on his health, and that in nine cases out of ten the state of the latter is directly dependent on the care taken of him in the days of his first service.

Writing of the pleasures of camping in a good open country in the cold weather, Forsyth says "Very little of this sort of thing fell in the way of Forest Officers of those days however. Our work lay in the depths of distant forests, or at most in the half reclaimed frontier belt lying between the hills and the plains, where timber transactions generally took place and the chief depôts for forest produce had been established. When by chance our direct route from forest to forest led across an open region our movements were as rapid as man and beasts could make them, and at the earliest possible moment we hurried again from the face of civilisation, like ghosts at cock-crow, to bury ourselves again in the depths of the wilderness." In after years Forsyth saw the reverse of the picture, when acting as Settlement Officer of Nimar. Speaking of the forests then, he said that he was able to look upon the forest-covered hills on the blue horizon as an agreeable vanishing point in the landscape, or as unpleasantly complicating the questions of liquor excise and police administration! It is amazing, he says, what a difference the point of view makes. After having been both Forest Officer and Settlement Officer with a large district, he wrote "The man who has dwelt for years amongst the forests, and their simple wild inhabitants, will regard nearly every question that arises in a wholly different light from

him whose experience has lain only among the cornfields of the plains, and their tame and settled tillers. And each of them will probably arrive at a conclusion as little comprehending the whole bearings of the question as the other." Such an opinion from as clever a man as Forsyth, who had served in both fields, is well worthy of remembrance.

To reach the Pachmarhi Hills Forsyth marched up the Narbadda Valley, and his remarks on that picturesque country show him to have been an ardent lover of Nature, in whose school he had trained his powers of observation to a very high pitch. When to this may be added a versatile pen and a rare power of expressing his thoughts one can gather what an interesting companion the man must have ever proved himself. Writing of a well-known scene of remarkable beauty, he says "What visitor to Jubbulpore can ever forget the Marble Rocks! In any country a mighty river pent up into a third of its width and for a space of two miles or more boiling along, deep and sullen, between two sheer walls of pure white marble a hundred feet in height, must form a scene of rare loveliness. But in a bustling (*sic*) dusty Oriental land, the charm of coolness and quiet belonging to these pure cold rocks and deep and blue and yet pellucid waters, is almost entrancing. The eye never wearies of the infinite variety of effect produced by the broken and reflected sunlight, now glancing from a pinnacle of snow-white marble reared against the deep blue of the sky as from a point of silver touching here and there with bright lights the prominences of the middle heights and again losing itself in the soft bluish greys of their recesses. Still lower down, the bases of the cliffs are almost lost in a hazy shadow so that it is hard to tell at which point the rocks have melted into the water, from whose depths the same lights in reverse order are reflected as clear as above, but broken into a thousand quivering fragments in the swirl of the pool." The man who penned this was meant to do more in the world than teach thick-skulled recruits how to hold a rifle and the neceties of the goose step, with all its reoccurring monotony. As is well known, the Rocks are guarded by swarms of the large bee (*Apis dorsata*), and many grievous accidents have resulted from meddling with their colonies. Forsyth says that the only resource if attacked by this insect is to rush into the nearest thick bush, break off a leafy branch and lay about with it wherever there is an opening. A native shikari of the writer's showed him another way. We were out shooting in April and were suddenly attacked by the bees. An incontinent stampede down the road, which we were luckily on, was the immediate result. A mile and a half ahead the forest suddenly ended, and the open country was reached, but it was not until we had left the forest line about a quarter of a mile behind that the last of our aggressors left us, numerous bad stings being the result of the attack. The bald head of my companion looked as if it was under the influence of some powerful hair restorer, for it

had suddenly regained a covering of stout stumpy hog bristles! Whilst we were engaged in woefully picking out the stings, aided by the assistant shikaris, the headman came up quite untouched and smiling. He explained that on the first onslaught of the bees he had followed us for a few yards, and then quietly stepped off the road and slipped behind a neighbouring sal tree. The bees, blind and mad with rage, followed the retreating enemy, and he was left in peace. The method requires a strong nerve and implicit faith in its effectiveness when one sees one's companions doing time in the distance, but he who is provided with both will find it the best protection in the case of an ordinary attack in the forest; for such will usually be from the representatives of but a few colonies of combs. It is only in the hotter parts of India that this bee is to be feared, and then chiefly from March to July. So desperate is their onslaught that it is said that during the Mutiny a large force of troops, horse and foot, were ignominiously routed in the neighbourhood of Lucknow by these terrible insects. As is commonly known, the honey and wax are exported and form a source of forest revenue in parts of the country. The habit of the bees in building high up on the branches of trees has, in the days of yore, been the death-blow of many a forest giant, for the wild *jungli* did not hesitate to fell a mighty sal tree for the sake of securing a single comb attached to a branch far up in the spreading crown; the value of the wax and honey obtained being a rupee or two, that of the tree destroyed and wasted several hundred. And yet there are some people still who wonder what the Forest Department was formed for!

Forsyth has some interesting observations upon the beautiful Narbada Valley as he found it in the sixties. It had formerly been the happy hunting ground of the Gonds and other wild tribes, who are now chiefly confined to the hills which surround it. In those days it could at most have been but scantily patched by their rude tillage, before the arrival of the Hindu races, who had cleared its forests, driven the wild elephant that roamed through them to the far east, and covered its black soil with an unbroken stretch of fine wheat cultivation. In less than three centuries this has come about, and yet it is often said that India is standing still in the history of the Nations! Everything proves that this country is a country still in its youth. The people strong limbed and healthy, an energetic race tilling an almost virgin soil, tilling it roughly still it is true, but, as Forsyth remarks, "the example of all new countries with much available land, even when, as in America, all the resources of capital and machinery are available, shows that a comparative rough culture of a large area is more remunerative than the higher tillage of a smaller area; and this alone is the cause of the rude state of agriculture still observed in this and many other parts of India."

Ethnologically the Hindu races of this tract are of great interest. They have generally been comprehended in the cate-

gory of "Aryan" as distinguished from the "Tauranian" peoples who are believed to have preceded the fair-complexioned Aryan invaders from Upper Asia in the occupation of Hindustan, and among them are included the remnants of wild tribes still found in the hills. These Hindu races have, however, themselves been subjected to some influence which has greatly modified the original high Aryan type—a type which includes the noblest races of mankind; the Caucasian of Europe, the Persian of High Asia, and the Sanscrit-speaking fair-skinned people who entered India from the north uncalculated ages ago. This influence has not been one of climate alone, for this would have affected all their descendants equally; whereas the very greatest range of diversity is to be found, from the light-coloured noble-featured Brahman of the extreme north-west to the black and negro-like Chamar or Parriah of the east and south. Everything proves that there has been a mingling of the immigrant race with the inferior Tauranian tribes whom they found occupying the soil before them. Judging from the physical features, few but the highest castes of Northern India can have any claim to purity of Aryan blood, and the admixture of indigenous blood, as indicated by colour and feature, becomes greater and greater the further away one goes from the seat of the original Aryan settlements in the North-West. The modern Hindus therefore are a composite race in all probability resulting from the absorption of a wave of Aryanism in a great ocean of peoples of a far inferior type—the type in fact which is at present found represented by such of them as have still remained undiluted in their inaccessible hills. It is this type which is so well known to many an Indian Forest Officer, the man who has roamed the forest-clad hills in undisputed sway for centuries. It was this type to whom the march of civilization and progress sent up Forsyth and his companions to make the first efforts at inculcating the doctrine of the value of the forests of the homeland and the disasters that would follow inevitably in the train of their total destruction. Can one be surprised at the difficulties which confronted and awaited such a crusade, and is it not really marvellous what wonderful success the Forest Pioneers, backed up by an ever-watchful and enlightened Government, achieved? There were apparently retrograde steps, one thought them so in those days (each one of us likes to see his life's work successful in his own time, it is but human nature), but it was merely a case of *reculer pour mieux sauter*, and we, their successors, can now fully recognize the full value of each step taken, and can see that it was a case of the more haste the worse speed. We, their successors, have still to bear the same truths in mind if we have the real interests of our mission in the country at heart.

Our soldier Forest Officer had plenty of sport whilst marching through the open country *en route* to the hills, and he has interesting notes on the various animals he met with. Amongst

herbivorous animals he mentions the black buck (*Antelope cervicapra*), the chikara or Indian gazelle (*Gazella bennettii*) and the Nilgai (*Boselaphus tragocamelus*), all antelopes. The carnivorous animals found in the open were the hunting leopard (*Felis jubata*), the wolf (*C. pallipes*) and jackal (*C. aureus*), the tiger and panther being rather denizens of the low hills than of the plains. Some most interesting stories on the habits of wolves are given. These animals gave great trouble during the construction of the railway through the low jungles north of Jubbulpore, attacking, killing and eating the labourers, full grown women, and at times men. The attack was commonly made by couples, one of the wolves seizing the victim by the neck from behind, while the other, coming swiftly up, tore out the entrails in front. These confirmed man-eaters were said to be very wary and fully able to discriminate between a helpless victim and an armed man. Amongst the animals of the plains must of course be included the boar—almost unrideable however in the black soil of the plains, interspersed by yawning creeks and fissures, or amongst the rolling trap boulders, which is the other alternative. Plenty of work for the shot gun is obtainable in the cold season. Snipe and wild fowl begin to arrive in these central regions of India, travelling from the frozen wilds of Central Asia, early in October, and before the end of November every piece of water and swampy hollow affords its contingent of birds. The common teal (*Nettion crecca*) and the whistling teal (*Dendrocygna javanica*) are the most numerous, as well as the first to make their appearance. The lovely blue-winged teal (*Querquedula ciria*) is scarcely less common; of larger ducks the red-headed pochards (*Netta rufina*), wigeon (*Mareca penelope*), pintail (*Dufila acuta*) gadwall (*Chaulelasmus streperus*) are found throughout the winter on most tanks. On the main rivers and on those large reservoirs such as Bhandara and Lachora in Nimar (the work of giants of ancient days, whose descendant appears to have made his appearance in the person of Sir W. Garstin in Egypt, if we are to believe recent reports) which may be called lakes, many other species of wild fowl are found, including the mallard (*Anas boschas*), common grey goose (*Anser ferus*) and black-backed goose (*Sarcidiorhis melanotus*) the latter being very common. Amongst wading birds, storks, herons, and cranes haunt the pools and marshes, and are a source of continual interest to the naturalist. The Demoiselle crane or coolen (*Anthropoides virgo*) is delicious eating, and may be seen in flocks in the wheat and gram fields, but will be found to be very difficult to approach. On river banks will also be found the sarus crane (*Grus antigone*) and the Brahminy duck (*Casarca rutila*). The gray quail, by no means so common as in Northern India, and the gray partridge, which is very common, are to be seen in the fields. The latter feeds freely in the vicinity of villages, and Forsyth mentions having seen a covey of them run out of the carcass of a dead

canal! The list comes to an end with the beautiful and sporting painted partridge (*Francolinus pictus*), which here replaces the black partridge (*Orygornis pondicerinus*) of Upper India.

Probably the most valuable tree of the plains to the villagers is the well-known mhowa (*Bassia latifolia*), the corolla of whose flower drops whole, and is eaten or used in the distillation of ardent spirits by the people, whilst the nuts, which form in bunches after the flowers have dropped, yield a thick oil much resembling tallow in appearance and properties.

Leaving the valley and plains we will now accompany Forsyth into the forests amongst the beautiful Mahadeo Hills.

(To be continued.)

### A Contribution to the Forest Flora of the Jubbulpore Division, C. P.

BY R. S. HOLE, F. C. H., F. L. S., F. E. S.

In 1900 a list of the trees, shrubs and climbers occurring in the Jubbulpore forests was drawn up for incorporation in the Working Plan. The list then prepared contained some 130 species. The list now given below includes several additional trees, shrubs and climbers which are found in the forests of the Jubbulpore Forest Division, also a few trees, shrubs and climbers, which are commonly cultivated in gardens or avenues, and, finally, a few herbaceous plants which are likely to be noticed by a Forest Officer on account of their coarse habit, showy flowers or economic importance.

The list is still very incomplete and, in a few instances, possibly inaccurate. I had hoped to be able to remedy this, and, also to add, among other things, details regarding the sylviculturally important characteristics of the principal species in this locality. An unexpected transfer has prevented this, at all events for the present, and the list is now given in the hope that it may be of some interest, even in its present very incomplete form. It may be mentioned here that two sets of experimental coppice-plots were opened in this Division a few years ago, which should furnish valuable information regarding the coppicing capacity of some of the principal species and their relative rate of growth.

In the present list particular attention has been paid to the vernacular names both as regards their frequent verification and their correct spelling. In some cases, however, the names given are doubtful and require further verification. They have been given as they may serve as a guide to future observers. It is as well to note that among the illiterate natives with whom the



Forest Officer principally comes in contact, the following letters appear to be freely interchangeable :—

n	and	l,	thus	nalli or lalli.
s	"	sh,	"	asto or ashto.
l	"	r,	"	aunla or aunra.
d	"	r,	"	lendia or lenria.
b	"	w,	"	tilban or tilwan.
ch	"	s,	"	sita phal or chita phal.

In Gondi, the word *marā*, which simply means *tree*, is usually added on to the name of the tree, thus *nalli marā*, etc.

Doubtful specimens have, through the kindness of the authorities at the Royal Botanic Gardens, been identified for me at Sibpur, and Rai Sahib Upendranath Kanjilal has also kindly done the same, in some cases, at the Herbarium of the Imperial Forest School, Dehra Dun.

The letters F. B. I. indicate the reference to Sir J. Hooker's *Flora of British India*, and a reference has also, when possible, been made to the *Forest Flora of N.-W. and Central India*, by Sir P. Brandis.

Before proceeding to the list itself a few remarks are given below to give a general idea of the locality here dealt with. In these remarks the numbers appended to the names of the various species are the serial numbers of the accompanying list.

The Jubbulpore Forest Division comprises all the Government Reserved Forests situated in the Jubbulpore Civil District of the Central Provinces, in addition to those of the Mandla District, which lie to the north-west of the Balai River. The area here considered, therefore, lies roughly between 22° 45' and 24° N. Lat. and between 79° 45' and 81° E. Long.

We are here on the great watershed between the Ganges and the Narbada, the drainage of the centre and south of the area flowing into the Indian Ocean *via* the Narbada, while that of the north finds its way into the Bay of Bengal through the tributaries of the Jumna and Ganges. Jubbulpore, the junction of the E. I. and G. I. P. Railways, is roughly midway between Bombay and Calcutta (by rail 784 miles from Calcutta and 616 miles from Bombay), and the central position occupied by this district in Peninsular India adds to the importance of its flora, which is already sufficiently interesting to the Forest Officer, owing to the fact that here the *teak* (258) and *sal* (14) forests meet.

The south of the area consists of a confused mass of trap hills, lying to the south and east of Jubbulpore town, on which are situated the forests of the Bargi, Dhanwahi and Jubbulpore Ranges, these including the principal teak forests of the Division. To the north of the trap, and running north-east and south-west, stretches the long narrow plain which occupies the greater portion of the Jubbulpore district. The northern part of this plain drains into the Ganges and the southern into the Narbada, the Bhureegurh Range of Bijawar rocks forming the watershed

between them. In the south, this plain is covered by a rich deposit of black cotton-soil, while in the north, low lateritic hills occupy a considerable area. The plain is bounded on the west and north by the Vindhyan Hills and on the south-east by a ridge of trap rocks running along the bank of the Mahanadi, this ridge being a projection of the mass of trap hills covering the south of the area.

In the north-east the plain continues in a tract of open country, occupied chiefly by the upper Gondwana beds of sandstone, clay and shale, on which are situated the most important sal forests of the Division. With the exception of this limited area the great majority of the Jubbulpore forests are situated on rugged hilly ground.

Jubbulpore town itself is about 1,458 feet above sea level, and the average elevation of the forests of the Division may be put at about 1,500 feet.

The climate is moderate for this region of India. The hot season may be said to extend from the middle of March to the middle of June, the rains from the middle of June to the middle of October, and the cold season from the middle of October to the middle of March. In 1882 the readings in the shade, at the Civil Station, Jubbulpore, were as follows in the three months which may be considered typical of the three seasons :—

May,	highest	111.9°F.	lowest	68.9°F.
July,	"	92.4°F.	"	70.1°F.
December,	"	82.8°F.	"	41.2°F.

Casual observations, taken while camping through the Division, during several hot seasons, showed that the temperature in the tent never rose above 110°F. The maximum temperature is often reached comparatively early in the hot season, but occasional thunderstorms prevent the temperature becoming excessive, and the character of the season naturally depends on the frequency or otherwise of these storms.

The average annual rainfall at Jubbulpore up to the years 1886 is returned at 52 inches. Readings taken at different places in the district, during the eight years following 1886, gave an average of 55 inches, the rainfall being greatest (64 inches) at Jubbulpore in the south of the area, and least (48 inches) at Bijeragogarh, near the laterite area in the north. Most of the year's fall is received during the south-west monsoon, the winter rains being variable and sometimes failing entirely. Occasionally years of deficient rainfall result in disastrous droughts, which cause great damage to the forest growth. This happened in 1899. The effect of the partial failure of the rains of that year on the forest growth was first manifested in the unusually early flowering of various species. Thus *chiola* (85) which, in ordinary years, does not here flower until March, was found in full flower on January 10th, 1900, and other species behaved similarly. Deciduous trees also shed their leaves earlier than usual, and

the young foliage appeared unusually early. All trees had then to undergo an exceptionally long hot season, the store of moisture in the soil, springs, tanks and streams being very small. The results were most disastrous, and were perhaps most clearly shown in the case of the evergreen mango (75). The terminal twigs and the ends of the branches first began to die, the damage then spreading, in many cases, until the whole crown had, completely withered; showing clearly that the roots were unable to obtain sufficient moisture from the soil for the maintenance of the transpiring leaf surface. When the deciduous trees put out their young foliage, practically the same thing happened to them. In June 1900 many *sal* were found to have been killed and *teak*, *dhawa* (151) and others were similarly affected, until the forests were filled with dead and dying trees. Special fellings were then undertaken, in the case of *teak*, with the object of utilizing the dead and dying trees, all those which were still green below, being carefully coppiced, in the hope that a fair coppice regrowth might be obtained. It will be interesting to note the results of these operations.

In these forests, where frequently there is only a demand for a few species and the revenue is not sufficiently large to justify the expenditure required for coppicing all the inferior species on any given area, it is important to note to what extent, if at all, good coppice regrowth of the best species can be expected, when only a few stems are cut here and there. Until this is known it is impossible to decide as to whether timber can be sold under present conditions from such areas, without ruining the forests, or not. With reference to the results of the abovementioned operations, it will probably be difficult to decide whether inferior coppice regrowth is due to want of sufficient light, or to the weakening effect of the drought on the stools. I have, however, seen cases where good coppice shoots have been obtained from both *teak* and *tinis* (90) stools, scattered in fairly dense forest, and I think that fair coppice growth may be expected where the forest is not exceptionally dense, or the bamboo (345) unusually thick.

The cold weather is here often severe. Near Kundam, which lies in the south of the tract, in the neighbourhood of *teak* forests, the thermometer has been recorded as low as 26°F., and the forest vegetation suffers severely from frost, especially in the north of the area. It may be interesting to note that, in the adjoining district of Damoh, in the beginning of January 1899, I found thick ice in the *garhas* standing in my tent verandah, and found *teak* saplings, 30 feet in height, with all their leaves and young shoots frozen. The most severe frosts occur in December—January.

With regard to the comparative susceptibility of the various species to frost damage, I have made a few observations, according

to which the species noted on have been arranged in the following classes :—

Class I.—Frost-hardy	{	<i>Chind</i> ...	(342)	<i>Khajuri</i> ...	(341)
		<i>Ber</i> ...	(62)	<i>Khair</i> ...	(126)
		<i>Reonjha</i> ...	(125)	<i>Karhār</i> ...	(174)
		<i>Bilsena</i> ...	(41)	<i>Karonda</i> ...	(198)
		<i>Ramna</i> ...	(128)	<i>Gurār</i> ...	(127)
		<i>Bamboo</i> ...	(345)	<i>Tinas</i> ...	(90)
		<i>Bel</i> ...	(48)	<i>Jamrassi</i> ...	(60)
Class II.—Less hardy	{	<i>Dhawai</i> ...	(158)	<i>Pāral</i> ...	(243)
		<i>Gālar</i> ...	(315)	<i>Koha</i> ...	(149)
		<i>Saj</i> ...	(150)	<i>Dhawa</i> ...	(151)
		<i>Harra</i> ...	(148)	<i>Mango</i> ...	(75)
		<i>Chiola</i> ...	(85)	<i>Seji</i> ...	(160)
		<i>Ghanto</i> ...	(192)	<i>Tendu</i> ...	(190)
Class III.—Frost-tender	{	<i>Ashto</i> ...	(105)	<i>Aunla</i> ...	(302)
		<i>Chār</i> ...	(76)	<i>Kanker</i> ...	(11)
		<i>Makor</i> ...	(61)	<i>Ghont</i> ...	(65)
		<i>Gunja</i> ...	(73)	<i>Pānsi</i> ...	(94)

This list has been compiled from the observed effects of frost on the various species in this area, individuals of approximately the same age and standing near one another in the same locality having been compared as far as possible. This list cannot, as yet, be regarded as at all final, and it is hoped that further observations will be made to verify it and to include additional species.

There is no doubt that frost is a very real danger to the forests of this Division, and particular attention must be paid to this point when carrying out the coppice with standard fellings prescribed by the Working Plan. The protection that is afforded to the coppice by a few additional small standards is very considerable, especially if the standards maintain their old leaves until January. This was strikingly shown in the exceptionally severe frost of December 1902, in the adjacent coupes 1 and 29 of Block 12. In the latter coupe a few more standards had been kept and the coppice was very little damaged, whereas in coupe 1, which had fewer standards, nearly all the coppice shoots had been cut.

The *sal* forests in the north of the area near Khitoli are particularly liable to frost damage. The excellent photograph taken by Mr. Lovegrove in the Chokam Valley of the Gauges Division, illustrating the effect of frost damage on *sal*, which was published in the *Indian Forester* for December 1901, might well have been taken in portions of the Khitoli forests, the injured hop-pole-like trees being very characteristic. I visited the Khitoli forests shortly after the unusually severe frost of December 1902, and the effect was most remarkable. In places every leaf of not only *sal*, but also of the other scattered inferior species was brown, and the entire forest looked as if it had been burnt. Every single leaf on a fine *sal* pole, 52 feet in height, was seen to have been killed, but as a rule in other parts of the forest the upper shoots of the large trees, above a height of 30 feet, had escaped injury.

In February and March hailstorms are common. In February 1901 I noticed the effect of a severe hailstorm on the young coppice growth in Block 12, in the north of the area. Coriaceous leaves, such as those of *Butea frondosa* (85) were riddled with holes, exactly as if they had been perforated with large shot, the tissue having turned brown near the holes. More delicate leaves had been torn into fragments, while the bark on the shoots was more or less bruised and torn.

A considerable number of insect pests occur in these forests, regarding which the following few notes have been collected :—

*Pyrausta machæralis* and *Hyblaea pueræ*.—Both these notorious defoliators of the *teak* tree are common within the area. *Pyrausta* larvæ may almost invariably be found on the *teak* leaves from June to November and, as a rule, they are far more numerous than are those of *Hyblaea*. I have never, however, seen such severe damage done to the mixed forests of this Division by *Pyrausta* as I have noticed in the practically pure *teak* forests, on the dry sandstone hills, in parts of the adjoining district of Damoh. As a rule very few *Hyblaea* larvæ are to be found on the *teak*, although they are generally present in considerable numbers on the *Millingtonia hortensis* (241) trees planted in gardens and avenues in and near Jubbulpore station, and probably occur similarly on other species of *Bignoniaceæ* in the forests. In normal years, however, the damage done by *Hyblaea* is insignificant, but when the season is particularly favourable for the insect and the larvæ occur in large numbers, not only the *teak* but several other species as well are completely defoliated over large areas. A severe attack occurred in July 1900, when the following trees were noticed as having been more or less completely defoliated :—

*Millingtonia hortensis*; *teak*, *Albizzia Lebbek* (121), *Anogeissus latifolia*, *Adina cordifolia*, *Stephegyne parvifolia* and *Terminalia Chebula* (harra).

A description of these two insects and of their life-history in this locality, by the present writer, appeared in the "Journal" of the Bombay Natural History Society for June 1904, Vol. XV, No. 4.

*Harra Gall Insect*.—The *harra* flower is very commonly attacked by a gall insect, bunches of small, round, dark-red galls being formed instead of the normal myrobalans, the red galls being very conspicuous in August—September against the full green of the foliage. I sent specimens of these galls to the Indian Museum in October 1900. The insects which emerged from the galls were pronounced to be chalcids and were forwarded to Monsieur André in France for identification. The latter, however, was unable to do more than identify the insects as chalcids, and he surmised that they were parasitic on the cynipids which produced the galls.

*Trigonodes ino*.—The larvæ of this Noctuid moth were found by me in May 1901 defoliating *Ficus religiosa*, which had then just put out its young foliage. The larvæ are voracious night feeders and trees attacked are rapidly defoliated.

*Pongamia glabra* "leaf-miner".—The leaves of this tree are frequently severely attacked by a leaf-mining insect. Specimens of larvæ and pupæ were sent by me to the Indian Museum in August 1901, but no imago was obtained and the insect could not be identified. The damage done resembles that of *Orchestes fagi* on beech in Europe, and the foliage of the attacked trees becomes a dull brown, just as if it had been frozen or scorched by fire.

*Pongamia glabra* "seed insect".—A large percentage of the seeds of this tree are commonly destroyed by a large, stout larva dark blue or purplish in colour. The eggs appear to be laid in the young ovules or seeds, remaining quiescent there until the seed matures. The larvæ then hatch out, devour the seed, and finally make their escape by eating their way through the hard indehiscent pod. To enable it to do this the larva appears to exude a red fluid, which possibly softens the thick hard pod, and the inside of the pod, near the exit hole, is usually stained red, as if it had been saturated with a red fluid.

*Premna latifolia* "defoliator".—This tree was defoliated by a larva in October 1900. The specimens collected died and I was unable to identify the insect. The larvæ leave the trees in the beginning of November, and appear to hibernate in the ground. They destroy the whole leaf tissue, leaving only the midrib and main lateral veins and, when feeding, they construct a compact white web on the leaves under which they lie.

The variety of geological formations occurring in the area is considerable. All of the following are represented within the limits of the reserves :—

- Alluvium.
- Laterite.
- Trap.
- Lametas.
- Upper Gondwanas.
- Upper and Lower Vindhyan.
- Bijawars.

The disintegration of the various rocks naturally results in the formation of soils of widely different characteristics, ranging from the loose sands of the Upper Gondwanas to stiff black soil from the scanty deposit on the Vindhyan plateaus of sheet rock to the deep alluvium on low-lying ground.

Although both *teak* and *sal* occur within the area, neither is here at its best. Naturally rather poor, these forests have further deteriorated under the old régime of irregular felling, unchecked forest fires and over-grazing, and wandering patch

cultivation. Naturally, then, these forests contain a large proportion of scrubby, crooked growth, consisting principally of old coppice and pollard shoots. Natural regeneration by seed is as a general rule exceedingly slow and unsatisfactory. (As an exception *Dendrocalamus strictus* may be noted. This species flowered throughout the Division about 1893, and magnificent reproduction resulted.) We are here at the northern limit of *teak* and the western limit of the Peninsular area of *sal*. The limiting line of *teak* enters the Division on the east in the neighbourhood of  $23^{\circ}30'$  N. lat., and thence extends across the area in a west north-west direction. Attempts were made, several years ago, to introduce *teak* into the Khitoli *sal* forests lying to the north of this line. Several plants are still existing, but the shoots sent out from the rootstocks are killed down annually by the frost; thus indicating that temperature is mainly responsible for limiting the distribution of *teak*.

From the Forest Officer's point of view the forests of the Division fall into three main types: (I) *sal* forest, (II) *teak* forest, (III) mixed forest with practically no *teak* or *sal*.

*Sal forest*.—The *sal* nowhere exceeds 80 feet in height, and the average is about 60 feet.

Practically all the largest sound trees were removed from these forests to supply sleepers for the construction of the East Indian Railway, but fine trees are occasionally met with, which show that the area is capable of producing large timber. The following may be cited as instances:—

A tree cut in 1867 is said to have yielded 300 cubic feet of sound timber. Another, found lying in the forest in 1875, had a basal diameter of 4 feet. In this latter year also, two standing trees were measured, and girthed respectively 8 feet 9 inches and 9 feet 2 inches.

During the recent sleeper operations, I measured a sound tree in Block 25 with a girth of 11 feet 3 inches. The forest contains the usual characteristic groups of nearly pure *sal*, alternating with open, grassy blanks, while the higher portions are occupied by miscellaneous species. The most remarkable point regarding these forests perhaps is the poverty of the reproduction of *sal* and the almost total absence of good *sal* advance growth. This is found to be the case in forests which have been closed to grazing and protected from fire since 1871. These forests suffer severely from frost, especially near Khitoli.

The *sal* is practically confined to the sandstones and conglomerates of the Gondwanas, and its extension westwards is abruptly checked when it comes in contact with the trap rocks.

*Teak forest*.—This is practically ordinary mixed forest with the addition of a varying proportion of *teak*. *Teak* is almost wholly confined to the hilly portions of the trap and Vindhyan areas, attaining its largest dimensions and being most numerous

on the trap. In the trap area, the trees on the tops of the hills are usually stunted, crooked and much branched, those on the slopes are most numerous and show the best growth, and those on the alluvial black soil in the valleys are usually of large girth, with buttresses and much branched. The latter contain a large proportion of sap-wood. Trees of large dimensions are scarce, owing principally no doubt to the best trees having been removed, under the old unregulated fellings, by the railway contractors. The average dimensions of the best trees now available are a height of about 50 feet and a girth of  $3\frac{1}{2}$  feet. The best teak forests usually contain a strong admixture of bamboo (*Dendrocalamus strictus*).

*Mixed forest*.—This is the most widely distributed type. The species most commonly found are—*dhowa* (151), *seji* (160), *saj* (150), *ghout* (65), *khair* (126), *tendu* (190), *mahun* (187), *char* (76), *aunla* (302), *salei* (51), *kulu* (30), *gunju* (73), *kenkar* (52), *tinus* (90), *kaim* (170), *chiola* (85). Slight variations in the local conditions of soil, aspect, etc., naturally affect the composition of the crop, and a number of subsidiary types are formed, which cannot be noticed in detail here. The dense growth of *siharu* (196), commonly seen on the low laterite hills, in the north of the area, is however sufficiently noticeable to deserve mention. To some extent at least, these thickets of *siharu* have, I believe, resulted from the indiscriminate coppicing of forests of the ordinary mixed type. The coppice growth of *siharu*, in such places, is far more vigorous at first than that of the other species with which it is associated, and the latter are gradually ousted in the struggle for existence. These forests have generally been subjected to heavy irregular fellings in the past, and trees of the better timber species, of large dimensions, are rarely found. They seldom exceed 50 feet in height and 3 feet in girth, and are usually much smaller than this, except in the more remote portions of the Sihora and Dhanwahi Ranges, where large specimens of *bija* (97), *dhawa* (151), *saj*, *tendu*, *tinus*, and others are sometimes seen.

No great attention, however, is at present paid to the question of the development of large timber in this type. The best of the timber species are very sparsely scattered over a large area, and the possibility of their profitable exploitation, for any exterior demand which may arise in the future, is very doubtful. At present, the demand for the better species, in this type, is entirely a local one, for poles for the construction of small buildings and agricultural implements, and there is practically no demand for large timber, *teak* and *sal* being almost invariably employed for construction in the better class of buildings and for most purposes for which large timber is usually required.

The present system of management wherever the demand makes systematic management possible is improvement fellings in the *sal* forests and coppice with standards everywhere else,



care being of course taken, in the case of *teak*, to favour as far as possible the production of good large timber. With these preliminary observations the list of species found in this locality is now given below without further remarks :—

## LIST OF SPECIES.

## ANONACEÆ.

- (1) *POLYALTHIA LONGIFOLIA*. Vern. *asok*.  
F. B. I. I. 62. Br. 4.  
Fl. March – April; commonly planted in gardens and avenues.
- (2) *SACCOPETALUM TOMENTOSUM*. Vern. *kāri*.  
F. B. I. I. 88. Br. 7.  
Fr. May – June.
- (3) *ANONA SQUAMOSA*. Vern. *chilaphal*.  
F. B. I. I. 78. Br. 6.  
Almost wild near Jubbulpore.

## MINISPERMACEÆ.

- (4) *CISSAMPELOS PAREIRA*.—  
F. B. I. I. 103. Br. 10.  
Fl. February.
- (5) *COCCULUS VILLOSUS*.—  
F. B. I. I. 101. Br. 9.  
Fl. December; fr. February.

## PAPAVERACEÆ.

- (6) *ARGEMONE MEXICANA*.—  
F. B. I. I. 117.  
Fl. Cold season.  
Robust herb; common weed of waste places.

## CAPPARIDÆÆ.

- (7) *CAPPARIS HORRIDA*. Vern. *aundha*.  
F. B. I. I. 178. Br. 15.  
Fl. February—March.
- (8) *CAPPARIS APHYLLA*. Vern. *karīl*.  
F. B. I. I. 174. Br. 14.  
Fl. hot reason.  
Planted in gardens.
- (9) *CRATAEVA RELIGIOSA*.—  
F. B. I. I. 172. Br. 16.  
Fl. April.  
Planted near Jubbulpore.

## BIXINEÆ.

- (10) *COCHLOSPERMUM GOSSYPIUM*. Vern.  $\left\{ \begin{array}{l} \text{gabdi.} \\ \text{ganīur.} \end{array} \right.$   
F. B. I. I. 190. Br. 17.  
Fl. hot reason, when tree is bare.

- TAMARISCINÆ.**

**DIPTEROCARPAE.**

## MALVACEAE

- Digitized by Google

- (22) *H. PANDURAEFORMIS*. Vern. *banambāri*.  
F. B. I. I. 338.  
Large herb; common in hedges; yellow flowers, cold season.
- (23) *H. PIRTUS* —  
F. B. I. I. 335.  
Fl. February;  
small shrub; cultivated.
- (24) *H. CANNABINUS*. Vern. *ambāri*.  
F. B. I. I. 339.  
Cultivated.
- (25) *H. ABELMOSCHUS*. Vern. *banberi*.  
F. B. I. I. 342.  
Tall herbaceous plant. The erect leafless stems, bearing the capsules and occasionally large yellow flowers, being very noticeable in the hedges in the cold season.
- (26) *ABUTILON INDICUM*. Vern. *tepāri*.  
F. B. I. I. 326.  
Fr. cold season. A common weed.
- (27) *SIDA SPINOSA*. —  
F. B. I. I. 323.  
Small shrub of waste places.  
Fl. January—February.
- (28) *GOSSYPIUM HERBACEUM*. Vern. *kapās*.  
F. B. I. I. 346.  
The common cotton; widely cultivated.
- (29) *G. BARBADENSE*. —  
F. B. I. I. 347.  
Occasionally cultivated in gardens.

## STERCULIACEÆ.

- (30) *STERCULIA URENS*. Vern. *kutāri*.  
F. B. I. I. 355. Br. 33.  
Leafless November—May; young leaves end of May and June.  
Fl. February. A very characteristic tree of dry rocky hills. In forests which have been burnt a remarkable contrast of colour is some time afforded in June by the black of the ground, the dark pink bark and bright green of the young leaves of this species.
- (31) *HELICTERES ISORA*. Vern. *enthi*.  
F. B. I. I. 365. Br. 34.  
Common shrub. Fl. in rains;  
ripe fruit in cold season.
- (32) *PTEROSPERMUM ACERIFOLIUM*. Vern. *machkund*.  
F. B. I. I. 368. Br. 35.  
Planted in avenues and near villages. Fl. April.

- (33) *ERIOLAENA HOOKERIANA*. Vern. *bhonti*.  
F. B. I. I. 370. Br. 36.  
Fl. rains. Fruit cold season.

## TILIACEÆ.

- (34) *GREWIA HIRSUTA*. Vern. *gursakri*.  
F. B. I. I. 391.  
Fl. rains; fruit cold season.  
The ripe, orange-coloured drupe has a very pleasant flavour.
- (35) *G. SALVIFOLIA*. Vern. *kursi, barsala, ghatyāri*.  
F. B. I. I. 386. Br. 43.  
Fl. rains. Fruit cold season.  
Drupe globose, purple.  
A shrub, common and attaining a considerable size in sal forests.  
I have noticed leaves up to 5½ inches in length and 2½ inches in breadth, which I believe belong to *G. excelsa*.  
F. B. I. I. 385.
- (36) *G. TILIAEFOLIA*. Vern. *dhamin*.  
F. B. I. I. 386. Br. 41.  
Fl. rains.
- (37) *G. ASIATICA*. Vern. *phalsa*.  
F. B. I. I. 386. Br. 40.  
Cultivated.
- (38) *TRIUMFETTA ROTUNDIFOLIA*.—  
F. B. I. I. 395.  
Small shrub in dry places.  
Fl. February.

## LINEÆ.

- (39) *LINUM USITATISSIMUM*. Vern. *alsi*.  
F. B. I. I. 410.  
The common linseed; widely cultivated.

## MALPIGHIACEÆ.

- (40) *HIPPAGE MADAGLOTA*. Vern. *kamphā*.  
F. B. I. I. 418. Br. 44.  
Fl. March. In damp places.

## RUTACEÆ.

- (41) *LIMONIA ACIDISSIMA*. Vern. *blisena*.  
F. B. I. I. 507. Br. 47.  
Fruit cold season.
- (42) *MURRAYA EXOTICA*.—  
F. B. I. I. 502. Br. 48.  
Cultivated in gardens.

- (43) *M. KOENIGII*. Vern. *kāripūt*.  
 F. B. I. I. 503. Br. 48.  
 Fl. March.  
 Cultivated in gardens.  
 Found once or twice some distance from villages, but doubtful if wild.
- (44) *CITRUS MEDICA*. —  
 F. B. I. I. 514. Br. 51.
- (45) *C. AURANTIUM*. —  
 F. B. I. I. 515. Br. 53.
- (46) *C. DECUMANA*. —  
 F. B. I. I. 516. Br. 55.
- (47) *FERONIA ELEPHANTUM*. —  
 F. B. I. I. 516. Br. 56.  
 Vern. *kaiṭha*, *katbel*.  
 Not truly wild; common near villages.
- (48) *ÆGLE MARMELOS*. — Vern. *bel* (Hindi); *muhaka* (Gondi).  
 F. B. I. I. 516. Br. 57.
- (49) *CLAUSENA WAMPLI*. —  
 F. B. I. I. 505.  
 Cultivated in gardens.  
 Fl. hot season.

## SIMARUBEÆ.

- (50) *AILANTHUS EXCELSA* Vern. *maha nim*.  
 F. B. I. I. 518. Br. 58.  
 Fruit March.  
 Planted in gardens and near villages.

## BURSERACEÆ.

- (51) *BOSWELLIA SERRATA* Vern. *salei*.  
 F. B. I. I. 528. Br. 61.  
 Fl. February—April, when the tree is leafless. Young leaves appear June; common on dry, rocky hills, often with *Sterculia urens* and *Odina Wodier*.
- (52) *GARUGA PINNATA* Vern. *kenkar*.  
 F. B. I. I. 528. Br. 62.  
 At a distance this tree somewhat resembles *Odina Wodier*, with which it often occurs, but in this locality they may be readily distinguished in autumn by the fact that the leaves of *Garuga* then turn crimson in colour while those of *Odina* are bright yellow.

## MELIACEÆ.

- (53) *MELIA AZADIRACHTA* Vern. *nim*.  
 F. B. I. I. 544. Br. 67.  
 Flower and young leaves in March.

- (54) *MELIA AZEDARACH*. Vern. *bakain, bara nim*.  
 F. B. I. I. 544. Br. 68.  
 Young leaf and flowers in hot season. Has a striking  
 appearance in the cold season when it is leafless and  
 covered with bunches of yellow fruit.  
 Planted in avenues and near villages.
- (55) *SOYMIDA FEBRIFUGA*. Vern. *rohan, rohani*.  
 F. B. I. I. 567. Br. 71.  
 Fl. hot season when young foliage appears.
- (56) *CHLOROXYLON SWIETENIA*. Vern. *bhira, girya*.  
 F. B. I. I. 569. Br. 74.  
 Fl. and young leaves March—April.  
 Usually on sandstone or limestone.

## OLACINÆ.

- (57) *OLAX SCANDENS*. Vern. *kakundan, adhanipāri*.  
 F. B. I. I. 575. Br. 75.

## CELASTRINÆ.

- (58) *GYMNOSPORIA MONTANA*. Vern. *bekal*.  
 F. B. I. I. 621. Br. 81.  
 (Syn *Celastrus senegalensis*.)
- (59) *CELASTRUS PANICULATUS*. Vern. *wārangar, kakūndan*.  
 F. B. I. I. 617. Br. 82.
- (60) *ELÆODENDRON GLAUCUM* Vern. *jamrassi*.  
 F. B. I. I. 623. Br. 82.  
 Leaves shed in March ; young foliage June ; flower cold  
 season.

## RHAMNÆ.

- (61) *ZIZYPHUS OENOPLIA*. Vern. *makor*.  
 F. B. I. I. 634. Br. 86.  
 Fruit ripens cold season.
- (62) *Z. JUJUBA*. Vern. *ber*.  
 F. B. I. I. 632. Br. 86.  
 Common on and near old village sites and in areas which  
 at one time or another have been under cultivation.  
 Its mode of occurrence conveys the impression that the  
 tree was originally introduced and has run wild from  
 cultivation. Two varieties are locally distinguished,  
*viz.* (1) the wild form, *dakora ber*, the globose fruit of  
 which ripens in December—January, and (2) the cul-  
 tivated form *sarra ber*, the fruit of which is oblong  
 and ripens in February—March. The fruit of both is  
 largely eaten, and has a more pleasant flavour than  
 that of the next species.
- (63) *Z. NUMMULARIA*. Vern. *jaria ber*.  
 F. B. I. I. 633. Br. 88.  
 This plant is always a small shrub or bush, never a tree,  
 and forms large straggling clumps in hedges and near  
 villages.

The fruit, which ripens in December, is widely eaten, but has a peculiar sickly flavour.

- (64) *Z. RUGOSA*. Vern. *sagra*.

F. B. I. I. 636. Br. 89.

Fl. March—April; fruit May—June. Leaves shed April.

- (65) *Z. XYLOPYRUS*. Vern.  $\left\{ \begin{array}{l} \text{ghont,} \\ \text{ghuter.} \\ \text{ghatōla.} \end{array} \right.$

F. B. I. I. 634. Br. 90.

Fl. April; fruit ripens cold season.

Often gregarious in dry, stony situations. One of the principal trees for the production of lac.

- (66) *VENTILAGO CALYCVLATA*. Vern. *keoti*.

F. B. I. I. 631. Br. 96.

Fl. cold season.

- (67) *HELINUS LANCEOLATUS*.—

F. B. I. I. 644. Br. 574.

#### AMPELIDÆ.

- (68) *VITIS LATIFOLIA*. Vern. *dokarbela* (Hindi); *doto* (Gondi).

F. B. I. I. 652. Br. 99.

Fl. August—September. Fr. September—December.

- (69) *V. CARNOSA*.—

F. B. I. I. 654. Br. 101.

Common in hedges. Fruit cold season.

#### SAPINDACEÆ.

- (70) *SCHLEICHERA TRIJUGA*. Vern. *kosam*.

F. B. I. I. 681. Br. 105.

Young foliage March.

Fl. April.

- (71) *SAPINDUS TRIFOLIATUS* (EMARGINATUS Vahl). Vern. *rithi*.

F. B. I. I. 682. Br. 107.

Planted near villages.

Fl. November. Fr. February—April.

- (72) *CARDIOSPERMUM HALICACABUM*.—

F. B. I. I. 670.

Fl. cold season. Fruit January—February.

(To be continued.)

## II.—CORRESPONDENCE.

### Fire Protection in the Teak Forests of Burma.

#### I.

In your August number Mr. A. Rodgers supplies us with some figures concerning damage to standing crops of teak by annual fires. These are very welcome, and we may hope that other officers will be able to give us statistics of a similar nature.

Of 3,959 trees girdled 60 per cent were more or less damaged by fire, but only 299 were sufficiently damaged to affect their commercial value. The average volume of the extractable timber may, I presume, be roughly put down at 60 cubic feet per tree and, as the royalty payable is I believe Rs. 30 per ton, the value to the Government of each girdled tree undamaged by fire may be put at Rs.36.

Nothing is said as to the amount of the damage, but it is presumably less than 50 per cent, and for the moment we will estimate it at 25 per cent on the average. The total damage then is Rs.  $9 \times 299$  or Rs.2,691. As this damage is in Mr. Rodger's opinion the result of 52 years of fire over 7,219 acres (or, say, 11 square miles), the annual damage per square mile is  $\frac{2691}{52 \times 11}$

or about Rs. 4-12-0. If we estimate the average damage per tree at 33 per cent, the total will be about Rs. 6-4-0 and 50 per cent will give about Rs. 9-5-0 per square mile per annum.

It would seem that with frequent periodical girdlings the damage might be reduced to a vanishing point, all damaged trees being girdled before they had passed from Class B to Class A.

H. S.

## II.

In his letter in the July number of the *Forester* "Non-Burman" challenges two statements made by me in the May number and I propose replying as briefly as possible to his remarks on both points.

As, however, I am at home on leave and have neither a copy of my previous letter nor the necessary classified lists to refer to, my remarks in connection with promotion must be somewhat incomplete.

First as regards fire protection. My letter in the May number was not a dissertation, lengthy or otherwise, on this subject only, and I frankly confess that I for one should never dream of saying that in Burma there are no teak forests that would benefit by fire protection. These would probably include the drier areas, but I am convinced that in the moister and better forests fire protection is the reverse of beneficial. Where to draw the line is more than can at present be said, and this must always be a difficulty, as several classes of forest are often more or less intimately intermixed.

"Non-Burman," referring to the first effects of fire conservancy, writes "Does it not favour the rapid growth of grass, shrubs and soft-wooded species more than that of the principal species? When, however, the fire protection is continuously successful for a sufficient length of time the conditions are altered. Does not then the dense growth of rank grass die down, and is it not then replaced by other finer sorts, which afford no obstruction to the germination of the seed, while the shrubby growth serves as a protection to the young seedlings." To the first question an



affirmative is the only answer possible. The second is more complex. In Burma grass plays a very minor part indeed as undergrowth in teak forest, and we have little knowledge of its behaviour under such conditions. Probably "Non-Burman" is quite correct, but under the circumstances it is a matter of little importance which does not affect the question at issue. As regards shrubby growth and soft-wooded species, I would ask "Non-Burman" two questions, *viz.*, What protection do teak seedlings require from shrubby growth? What about bamboos and the soft-wooded quick-growing species favoured by fire conservancy? Do they also die out or afford protection to the teak. or do they grow up and produce conditions most unfavourable to the germination and growth of any light-demanding slow-growing species such as teak?

It will scarcely be claimed that the soft-wooded species die out and their rapid increase in number and size, together with the great fire-resisting power of our principal species, are the two main arguments in favour of non-protection in the vast majority of our Burma forests. The effects of fire conservancy are just as likely to be serious and far-reaching as those of non-protection. We know the results of annual fires. Who will tell us the results of, say, 20 years' costly and continuously successful protection?

There is nothing new or original in "Non-Burman's" suggestion that we should protect our forests *successfully* and *continuously*, and we are doing as much as possible in that direction. We do not allow the protected areas to burn intentionally, but, as I have in my previous letter given reasons why no great improvement in results can be expected under existing conditions, there is no necessity to repeat them. All the same we have areas which have been successfully protected for a number of years, and I have not heard of any improvement in reproduction having been noticed. So far as my own experience goes the reverse is usually the case, and dissertations based on observations can no more be described as *purely* academic than such observations can be called conclusive proof. If they lead to further enquiry, discussion and experiment, they can only be beneficial, and I still maintain that men who have had the teak forests of Burma under observation for years are in a better position to judge of their requirements than men who have never seen them. At the same time I do not claim that the case against fire conservancy is *proved*, but I am glad to say that further extension has for the present been stopped, and this should enable us to devote more attention to the areas already under protection.

It is somewhat unfortunate that "Non-Burman" cannot visit Burma. Such a visit would not of course settle the question once for all, but it could scarcely fail to convince him that there is a great deal to be said on both sides. We shall get on faster when that is generally admitted.

"Non-Burman's" remarks are not to be taken to apply to areas where there is bamboo undergrowth. In saying this he makes them applicable to only a very small, almost infinitesimal proportion of the Burma teak forests. I have heard of an area in the Upper Chindwin Division where there is an undergrowth of Bison grass and of other areas in the northern and more remote districts where bamboo undergrowth is absent, but these form a very small percentage of the whole, and when the teak forests of Burma are referred to generally it should be assumed that there is a more or less dense undergrowth of bamboo. The forests are not homogeneous, but are broken up by areas of evergreen or Indaing (both practically without teak) and by strips of level alluvial land (often rich in teak) near the streams and rivers. Such areas are generally free from bamboo undergrowth, but their total importance is so comparatively small as to render them absolutely negligible in a general discussion. There are valuable teak forests free from bamboo undergrowth (Kangyi in the Tharrawaddy Division, for example), but the prevailing characteristic of the vast majority of the best and most accessible is a more or less dense undergrowth of bamboo. It seems advisable to lay stress on this point, as it appears not to be generally known to persons ignorant of Burma.

Now for the second point. For reasons already indicated I am unable at present to give facts and figures to substantiate my statement that promotion in Burma has of late years been retarded owing to the frequent transfers of senior men from India, but I will do so as soon as possible. There may be exceptions, but many of us are painfully aware that we have drawn several thousands of rupees less pay than our contemporaries (and in some cases our juniors) in India, and this, to us at any rate, is a very convincing argument. I don't know what service "Non-Burman" has, but if it is 15 years or less, and he will compare his position and the positions of men a few years senior and junior to him in India with those of men of similar service in Burma, I think he will find that the Indian men have considerably the advantage. There are men in Burma of less than 15 years' service who are drawing only Rs.100 per mensem more than others 9,10, and even 11 years junior to them. This will give some indication of the block there has been, and still is, and there is no apparent chance of much improvement for years to come. We are hoping for another reorganization soon (the last was in 1895 or 1896) to improve matters.

I am of course aware of the manner in which Conservators are selected, but I cannot agree that the removal from Burma of Messrs. Gradon, Muriel, Jackson and E. S. Carr, whether permanent or otherwise, during the last year or two counterbalances the effect of the transfer from India to Burma of relay after relay of senior men during the last 10 or 12 years. I am not questioning the necessity for these transfers, but merely alluding to their effect on promotion in Burma.

"Non-Burman" is incorrect in thinking that none of the Deputy Conservators transferred from India now remain on the Burma list. He is also incorrect in saying that the four men whose names he mentions are lost to the Burma service. Two of them are, so far as I know, merely seconded, and may be expected to return, while the other two have been exchanged, one of the substitutes being in the happy position of drawing Rs. 150 per mensem less pay in Burma than before his transfer from India.

"Non-Burman" appears to be annoyed at my statement that promotion in Burma has been slower than in India. I regret this, because I had no intention of causing annoyance to anyone in this connection, and I never heard any Burma Forest Officer, begrudge his Indian contemporaries their more rapid promotion. It is not too fast, and if we envy them, it is only natural. The only arrangement that would equalize promotion in all Provinces would appear to be a combined list. Failing that it is surely permissible to regret any considerable difference.

S. CARE.

11th August 1904.

### III.

Mr. Rodger in the *Indian Forester* for August gives some very interesting statistics concerning the damage done by fire. He shows that on an average of 100 mature teak trees 8 will be in Class A, namely trees of which the commercial value has been decreased by fire, 52 will be in Class B, namely trees of which the commercial value has not been decreased, but which have been badly scarred by fire, 40 will be in Class C, namely trees unmarked by fire. The trees girdled by Mr. Rodger presumably contained many very old and over-mature trees very susceptible to damage from fire. But I will assume, to be on the safe side, that when next the same areas are gone over in the following period the same percentage of trees damaged by fire will be found.

Of trees in Class B, it is clear that very few will pass into Class A, as in this case a totally different percentage would be obtained. As regards their vitality being injured, and in consequence less annual increment being put on annually, it is generally agreed, and some experiments carried out tended to show, that there is practically no difference in the increment put on trees inside and outside protected areas.

As regards trees in Class A, I will assume that half their commercial value is lost, or, in other words, that 4 per cent of the commercial value of the total volume of timber extracted is lost. Now all these trees have passed through several periods in which Kyathaungwa has flowered. When Kyathaungwa forest is cut over and burnt the fire is very fierce, and one cannot comfortably approach it nearer than 50 yards. As the heat is caused principally by the burning of bamboos, when

Kyathangwa flowers and dies, the resulting fire will be very similar to a taungya fire. As the ordinary leaf fire is so mild in comparison, I will assume that of the 4 per cent loss of commercial value as obtained above, three-quarters is caused by such a fire and one quarter or 1 per cent of the total volume by the mild leaf fires against which we are protecting our forests. I see no reason why the loss of commercial value should not be calculated at 1 per cent, but in my subsequent calculations I have assumed the loss to be ten times this amount.

I have obtained the following data from West Swa Working Plan report. Value of standing crop extracted each year, obtained by deducting the cost of extraction from the estimated value of the timber, Rs.58,000. Multiplying this by the number of years in the period, 32, and dividing by the total area 147.96 square miles, I obtain the value of the standing crop extracted from each square mile during the period, namely, Rs. 12,544. Ten per cent, then, of this I estimate as the loss from fire, namely, Rs. 1,254.

Now the cost of fire protection at Rs.40 as given by Mr. Long, excluding cost of establishment, amounts during the period at 3 per cent compound interest to Rs. 2,163. Therefore this cost is Rs. 909 greater than the value of the timber destroyed by fire. I have made similar calculations for most of the other Working Circles in Lower Burma as follows:—

Working Circle.	Period in years.	Value of timber destroyed by fire per sq. mile in each period.	Cost of fire protection for each period per sq. mile.	Gain.	Loss.
West Swa	32	1,254	2,163	...	909
Gwethe	30	2,999	1,960	1,039	...
Kabaung	30	909	1,960	...	1,051
Pondaung	30	2,507	1,960	547	...
Saing-Yane	30	2,664	1,960	704	...
Kyaukmasin	30	1,902	1,960	...	58
P'yu Kun	33	1,697	2,266	...	569
Taungnyo	30	1,484	1,960	...	476
Shwele	30	1,097	1,960	...	863
Nawin	30	1,312	1,960	...	648
Thonze	30	1,028	1,960	...	932
Kadinbin	30	1,008	1,960	...	952
Mokha	30	967	1,960	...	993
Minhla	35	1,889	2,491	...	602
Bawbin	30	1,613	1,960	...	347
Gamon	30	1,538	1,960	...	422

These figures would be very much more accurate if the loss caused by fire was estimated at 1 per cent, and if in calculating the

cost of fire protection part of the cost of establishment was taken into consideration, and if it was reckoned that fire protection was not always successful, the results would be then even more remarkable.

In these calculations I have not taken into consideration the loss caused by fire protection. These forests have been burnt over from time immemorial, and therefore the state of the growing stock shows the worst that fire can do. It is quite clear, however, that without fire protection we are certain of obtaining the same annual yield from our Working Circles as we are obtaining now, that is to say, we have a safe and assured yield. On the other hand, we by no means know the worst that fire protection can do. Even after a period of five years of fire protection the decrease of teak reproduction is very marked, and presumably for every year of fire protection there will be less and less reproduction. In the oldest protected area I have seen, which has been successfully protected for 30 years (by mistake I previously gave this figure as 40 years), the reproduction of teak was practically nil. As the shade is very much greater in a protected area than in an area not so protected, it is reasonable to assume that a very much smaller proportion will survive. The shade is for the most part caused by bamboos, which it is almost useless to cut back. It therefore seems probable that whereas from an area from which 100 trees are now girdled of which the commercial value of only 8 per cent. is affected by fire, we shall obtain at the end of the rotation from the same area only 50 trees badly twisted and distorted by suppression or possibly no trees at all.

I have made these calculations in reply to Mr. Long's article, and also because it has been urged that objections to fire protection are based on too purely theoretical grounds, and as the conclusion I have arrived at is that fire protection is unprofitable, I would invite any fire protectionist to show that my conclusion is inaccurate.

The views of the Government of India are apparently that every teak forest in Burma should be protected from fire in the shortest possible time, if not sooner, and that when any doubt is expressed as to whether fire protection is profitable, the matter can be ignored on the grounds that any discussion on the subject is academic. There are, however, large areas successfully protected for 10, 20 and 30 years, and if the Government of India consented to cease extending fire protection to new areas for a year or two, Forest Officers would have time to collect data from these areas and neighbouring unprotected areas, and could definitely ascertain whether or not fire protection is profitable. If, however, we protect every teak forest in Burma successfully for a number of years, as the Government desires, and it is then discovered that fire protection is unprofitable (as the evidence hitherto collected inclines many of us to believe, there will be a

great scandal, and ignorant outsiders are almost certain to blame the Forest Department.

I extract the following from the resolution of the Government of Burma on the Administration Report for 1902-03: "The Lieutenant-Governor does not propose to discuss the merits or demerits of fire protection to which two of the Conservators refer in their reports. The problem to be solved is not whether fire protection is advantageous, but how such protection can be made effective," etc. When half the Conservators go out of their way to express doubt as to the value of fire protection; it follows that there must be something in the matter. The only conclusion to be drawn from the above is that the Local Government is indifferent as to whether fire protection is profitable or not.

"Non-Burman" in the *Indian Forester* for July states that "lengthy dissertations on fire protection which in the present state of affairs are purely academic" are "none the less likely to have far-reaching effects if, when too late, they are proved fallacious." (*N.B.*—I regret greatly that this epistle is again very lengthy.) "Non-Burman" writes as though there was a section of Forest Officers in Burma anxious to get fire protection abolished. This is not, I think, quite the case. Government has spent large sums of money on fire protection, and it would obviously be undesirable to render this expenditure of no account by suddenly abolishing fire protection. There are, however, I believe, many Forest Officers, myself among them, who consider that there are strong reasons for doubting that fire protection is advantageous, and that before further extending fire protection some attempt should be made to prove that the operation is profitable. On the other hand, there is a section of Forest Officers who seem to consider that fire protection is a kind of holy subject to be spoken of with bated breath, and that a word against it is little short of heresy. I can readily understand that the benefits of fire protection may be expected to be gradual and at first difficult to prove, and that for some time opposition is to be deprecated; but what I cannot understand is that so far as I can discover no real and systematic attempt has been made to study the effect of fire protection and to ascertain what the benefits are. I can understand, though not very readily, that where a valuable species of tree is found with an undergrowth of grass, continued fire protection may cause the coarser grasses to give way to finer grass to the advantage of the valuable species; but here in Lower Burma teak is almost invariably found with a dense undergrowth of bamboo, and as a short period of fire protection has the effect of retarding the natural regeneration of teak. I cannot understand how a continued course of fire protection can be expected to have any other result than to intensify this effect. In any case I maintain that fire protection has been continued for a reasonable length of time. It is a

fundamental axiom in forestry that any very considerable expenditure should be justified, and it seems to me a most futile argument to maintain that the question cannot be proved if, as I think I am correct in saying, no attempt has been made to collect proof. There is I think a great deal of evidence to show that our forests are deteriorating under fire protection, and I think this would be emphasized were statistics collected. At present opinions are most hopelessly divided, and this deplorable state of affairs could I think best be remedied by a careful attempt to ascertain the truth in an impartial spirit.

H. C. WALKER.

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#### IV.

My attention has been drawn to an extract of my diary on page 155 of the April 1904 number of the *Indian Forester* and to a letter from Mr. Carter on page 371 of the August number.

(2) I must first mention that what I wrote in my diary was not intended to be used as an argument for or against fire protection in general. I discovered that the eastern fire line in the part of the Lower Thoungyin Reserves in question protected large areas of Engdaing, Evergreen, ponzos, and rather poor teak forest, and that large rich teak forests outside the fire line and between it and the Thoungyin River were very severely burnt every year—

1. By the Siamese Shan villagers, hunters and others.

2. By the Government fire coolies, who burnt the forest outwards from the fire line to prevent the possibility of fire coming into the fire protected area.

I had several times advocated in my diaries a more rational system of fire protection for these teak forests, and the facts given by me in my diary were intended to emphasize the necessity of protecting the portions of the reserve outside the fire line rather than the so-called fire-protected area inside it. This is evident from the last portion of the extract of my diary.

(3) Having given the above explanation, I may say that, after two years' Working Plans duty performed in them, I think that fire protection as attempted in the Lower Thoungyin Reserves, which are 265 square miles in extent and contain much teak, is carried out on the wrong lines. Up to this year the whole reserved area was shown as fire protected, and yet the exterior fire line on the east was in places over two miles away from the reserved boundary, and the rich teak area between it and the boundary, namely, the Thoungyin River was burnt over more than once each year, and once a year actually by the fire coolies. As far as I am aware, no notice is taken of fires outside the fire line, though in the reserve. This is the result of having a ridiculously inadequate controlling staff. Part of last working

season there were I believe one Divisional Forest Officer, no Assistants, and no Rangers in the Thoungyin Division, which is one of the most important in Burma. The important Lower Thoungyin Range, containing 265 square miles of Teak Reserves, was being run by a Karen Deputy Ranger, recently promoted from Forester, assisted by three Foresters and four inexperienced Forest Guards. It is absurd to expect useful fire protection under these conditions: the area attempted is far too great.

(4) To return to the area mentioned in my diary. It is one of many dry inflammable areas near the Thoungyin River in which severe ground fires, which sometimes become tree fires, burn every year—not an ordinary creeping ground fire as supposed by Mr. Carter. The few remaining large standing teak trees are all more or less badly burnt at the base, and the large number of wholly or partially consumed trees lying on the ground and the numerous burnt stumps testify to the severity of the fires. By a “wholly consumed tree” is meant a tree which is so burnt that only an end or two remains and the place where it lay is recognisable by a long thick line of ashes. In such a forest a really sound green teak over 7' girth is very scarce, and it becomes necessary to order the enumerating coolies to take as a sound teak tree over 7' girth one that would yield one or more marketable logs. Many of these trees are very large and over-mature, and are burnt all the way up, sometimes inside, sometimes outside.

(5) It is quite possible for a tree that is badly burnt at the base to give two sound marketable teak logs. This tree might be enumerated one season as a sound green teak tree over 7'. After being burnt two or three times in one fire season, or more probably after being alight for two or three months in one fire season, it is conceivable that such a tree might fall down. During the next cold weather's enumeration such a tree would perhaps be put into the “Auleuathat” class. The sample area in question was a large one and the teak in it very numerous. As I personally checked the recount made a year after the original count, and as I failed to find any signs of extraction by contractors or thieves, and as I saw many enormous teak trees in all stages of cremation lying on the ground, I think it probable that there was no very great error in enumeration, but of course this is possible, especially as the first count had to be made by Karens who knew no Burmese and who had to be taught what to call out in Burmese, more or less like teaching a parrot. Furthermore, as a Karen usually stuffs his mouth with betel-nut like a monkey, he is not always intelligible.

(6) Under the present costly system of annual fire protection, no improvement fellings and the clearing of large areas of teak productive forest to make teak plantations of doubtful utility, it is conceivable that a large part of the existing teak forests in a



locality like the Thoungyin may in time disappear. The reproduction of teak in fire-protected areas may cease altogether, and the evergreen will in time most certainly envelope the forests all round it.

(7) If the remarks on fire protection and teak plantations made by me in the rough draft of the Lower Thoungyin Working Plan are published, no one will be able to say that I am chary of expressing my opinions on fire protection and teak regeneration.

The above remarks on the fire protection up to the end of 1903, of some of the Reserves in the Thoungyin Division, which is some thousands of square miles in extent, are not intended as an attack upon anyone, but merely to draw attention to a position which merits the most careful consideration. We have been continually urged during the last three or four years to largely increase the fire-protected area and apparently to cover as much of the Reserve as possible with teak plantations quite regardless as to whether the results are really beneficial and of the fact that to carry out these operations successfully, an enormous increase in establishment is essential. In the Thoungyin Division the establishment has decreased both in quality and numbers, and yet in order to show good results, which are in reality unobtainable under existing conditions, more areas are attempted to be protected and more plantations are made annually. The burning of teak forests and contractors' teak logs and the cutting down of teak productive forests by the Thoungya cutter have sometimes been the result. I was in charge of the Thoungyin Division from November 1901 to May 1902. During part of this time I was also in charge of the Atarn Division. Until March 1902 there were no Government baggage elephants in the Division, and other elephants being unobtainable a tour in the Thoungyin was out of the question till March. I then visited parts of the Western and Southern fire lines, but not those along the Thoungyin River, as I had to hasten back to Moulmein at the end of March to personally prepare and sign yearly, quarterly, and monthly returns and accounts, etc. I only knew of the above facts after I had commenced Working Plans in these forests. In the dry weather of 1904 new fire lines nearer the river have been made, but there has been no reliable and experienced officer available to align them, and even now the rich teak forests in the bends of the river have I believe been left outside. When a European Assistant is stationed permanently in these valuable forests there may be some hope of better results.

RAEL.

**Fire Protection.****A SUGGESTION.**

Although most readers of the *Indian Forester* are probably not averse to a rest from fire protection during the off season, I venture to briefly discuss one aspect of this subject in the hope of eliciting criticism.

In most divisions the ever-recurring annual expenditure on clearing guide lines and boundaries probably constitutes about 50 per cent of the total fire-protection charges and entails the devotion of considerable time and trouble, which might be more profitably employed. Quoting from the accounts of my present division, taking averages for three years, the expenditure on clearing lines bears the proportion of 4 to 5 to the combined expenditure of burning the lines and maintaining a special protective staff.

The cost of burning lines and pay of fire-patrols must presumably remain more or less a constant, but it should be possible to devise some effective means by which guide lines and boundaries may be kept permanently clear without any prohibitive initial outlay.

The usual absence of vegetation under the shisham trees, probably due to the products of decomposition of its fallen leaves, offers perhaps a solution to the problem.

May not the fire lines of the future—where climatic conditions permit—be wide avenues of shisham trees, the area under their crowns being natural guide lines, clear of vegetation and with but a thin sprinkling of leaves and thus less dangerous than the grass stubble so common on cleared guide lines; the leaves could be easily swept away from the grass-covered fire line just before the time for burning arrives.

The young shisham trees might be planted on each side of a fire line about five feet from the margin of the forest and, in the case of boundaries, a few feet to the forest side of the line joining the centres of the boundary posts or pillars.

The initial expenditure of planting would probably in the case of shisham turn out to be a profitable investment in any case. On their attaining an exploitable size alternate trees could be removed, the gaps being planted up, and a few years allowed to lapse before felling the remaining mature trees so as to maintain continuity of cover as far as possible.

In parts of India where the shisham will not thrive possibly other species which drop their leaves before the hot weather and kill out vegetation underneath their crowns by the density of their foliage might be found to answer the same purpose.

E. R. STEVENS.

DEHRA DUN :  
17th August 1904.

## III.—OFFICIAL PAPERS AND INTELLIGENCE.

**Rubber-producing Plants in Burma.**

Little is known about the great majority of the numerous rubber-producing plants which exist throughout Burma, and with the present day enormous consumption of rubber for various purposes, the recent action of the Burma Government \* in causing enquiries to be made into the qualities of some of the known rubber-producing plants is very opportune.

Attention has been confined principally for the present to *Parameria glandulifera* and *Chavanessia esculenta*, two creepers which, besides having been tried in plantations, are of common occurrence in the hills and on most lands which stand above flood level. It is reported that the extension of cultivation and of *taungya* clearings has reduced the area over which they are to be found, but there must still be extensive tracts on which those two species abound.

The enquiry originally aimed at ascertaining the market possibilities of these two rubbers, but at first the object of the enquiry was lost sight of, and the experiments were carried out on too small a scale to be of much practical value in supplying data for the cost of collection, preparation and freight. Unless these be favourable, the best rubber in the world may have no commercial value.

Experiments carried out with the latices of the two rubbers show that coagulation takes place naturally in both cases in about 48 hours. The addition of small amounts (15 drops) of creosote and acetic acid had no effect in either case in expediting coagulation. A small pinch of alum added to the latex resulted in instantaneous coagulation in both cases.

Specimens of both rubbers were sent to the Reporter on Economic Products to the Government of India, who gave his opinion that judging from the specimens received good rubber could be got in many ways from both species. Fresh samples have been sent to the Imperial Institute for analysis in order to ascertain the percentage of resin in the latices—an important point; with this information and a knowledge of the cost of preparation and freight and the supply available, the Department should shortly be able to say what are the possibilities of those two rubber species in Burma.

What is believed to be an important discovery in connection with the production of rubber has been made by Mr. Stearsey, Extra Assistant Conservator of Forests. He has reported that the creeper *Rhynchodia wallichii*, Bentham, which abounds on lands submerged to a depth of 10 or 12 feet during floods, yields a good rubber. He has forwarded some samples of the rubber, which are described as excellent; samples have been to the Imperial Institute for analysis and valuation.

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\* From correspondence communicated to the Editor by the Government of India.

### Green Leaves for Manure.

Throughout a very considerable portion of Madras a large demand exists for green leaves as manure for wet cultivation. The loppings of trees are strewn on the wet fields and are ploughed in and allowed to decay. The cultivator makes use of almost any soft-leaved species, but those most in favour are—*Cassia auriculata*, *Pongamia glabra*, *Tephrosia purpurea*, *Dolichan-drone crista*, and *Calotropis gigantea*.

For some time past the Madras Government \* have been considering what measures should be adopted to further the use of leaves for this purpose and to increase the supply available in Reserved Forests. It has now been decided to select some large areas of land for this purpose. If these are intelligently selected and are worked under some system of pollarding or coppicing with a view solely to their leaf-yielding capabilities, much good may be anticipated. To combine the production of leaves for manure with the yielding of timber or even fire wood will be practically impossible. Nor is it desirable, as the intention is to meet an already existing demand in the manner most suited to the requirements of the cultivating classes.

### IV.—REVIEWS.

#### A French Review of the new edition of Schlich's "Manual of Forestry," Vol. II.

The *Revue des Eaux et Forêts* of the 15th August contains an interesting review, from a French point of view, of the third edition of Volume II of Dr. Schlich's "Manual of Forestry."

The reviewer, Mr. Huffel, of the Nancy Forest School, recognizes the difficulty which at the outset Dr. Schlich had to meet, in writing a manual of silviculture for England, a country without either forests or forest traditions of its own. Silviculture is of necessity a local science, unless one is willing to confine it systematically to generalities. Hence it is not surprising that Dr. Schlich has had to draw much of his material from foreign sources, but, as the conditions of vegetation, even within such a limited distance as, for example, that which separates the north-east of France from the centre vary so much that the frequency of seed-years, the ease with which trees will coppice, the age at which they will bear fertile seed, and similar local phenomena are quite different in different localities, it is open to question whether Dr. Schlich would not have done better to have based his teaching on observations made in Great Britain, than on the opinions of Bavarian and Hessian writers.

Section VI of the first chapter of the first part is devoted to the assessment of the quality of the locality,—the *bonitierung* of the

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\* From papers communicated to the Editor by the Government of Fort St. George.

Germans, an operation generally considered chimerical, which consists in classifying different soils and climates into a small number of defined types with a view to fix for the far future the production in cubic feet per acre per annum in each type of locality, both for existing crops, and for crops not yet brought into existence. The systems of fixing the possibility which required some such device for estimating the future yield of the forest, have now gone quite out of fashion, and this method is not likely to be of much practical utility in the United Kingdom.

The fourth chapter is devoted to a description of the different systems of treatment, and, though some dozen of systems are described, the whole chapter consists of less than twenty pages. It is much too short, and terminates with the time-honoured comparison between the different systems. Many foresters will hardly share Dr. Schlich's opinion that the outturn of a coppice with standards will hardly be inferior to that of a High Forest.

The second part of the book is devoted to regeneration, natural and artificial, and French foresters (the reviewer says) will be astonished to see that the latter holds the first rank, and occupies twice as much space as natural regeneration. This shows to what an extent Dr. Schlich's opinions are coloured by German influences, but may also bear reference to the peculiar conditions in which English foresters are placed, who more often have to create new crops artificially, than to regenerate naturally old ones.

*Part III.* Tending of woods is considered by Mr. Huffel to be the best part of the book, and the chapter on thinnings is in the reviewer's opinion the best didactic study ever published out of France on this most important subject.

The review closes by heartily recommending the new edition of this book to both English and French foresters.

#### V-SHIKAR AND TRAVEL.

#### Fairy Tales for Forest Folks.

I trust I am not guilty of betraying official secrets in sending you a copy of an interesting note drawn up by Maung Po Sein, Accountant in the Office of the Conservator of Forests, Pegu Circle, Burma, anent the correct spelling of the Burmese names of plants. It seems that there is quite a treasury of fairy legend or of folk-lore in these names, which may lend and interest to the search for economic products that are so frequently asked for now-a-days. The legend communicated by Maung Po Sein was elicited in connection with the collection of *Olerodendron inerme*, Gaertn, for which the name *Kyaungban* (cat's flower) had been supplied. Maung Po Sein informs us that this is the Burmese name of another but closely allied plant, viz., *Vitex agnus castus*, L. (var. *V. trifolia*), whilst *C. inerme* is called Pinlé,-Yé-, or Sin-Kyaungban, and he relates a pretty fairy tale

to explain the correct spelling of *Kyaungban* in the vernacular. The book, edited by an Admiral of the Burmese Fleet of Royal Boats, would be very interesting to those acquainted with Burmese who make a study of folk-lore. The dedication of Major Prain's *Bengal Plants* to Mr. H. H. Risley, C. I. E., shows how the study of plants is linked with the study of ethnology.

F. B. MANSON.

### KYAUNGBAN.

With reference to the Conservator's question of yesterday I respectfully beg to submit herewith a legend in connection with Kyaungban plants, together with specimens of two kinds of Kyaungbans which I can procure in Rangoon.

Specimen (1)—Kyaungban.

Specimen (2)—Ye Kyaungban, Pinlé Kyaungban, or Sin Kyaungban.

*Legend.*—Once upon a time a man begged of a woman who was far advanced in her pregnancy to give him her daughter in marriage on her issue. The woman replied "My child, it is hard to foretell what will be the issue and I cannot say whether it will be a cat or rat."

"Dear mother," said the man, "it is quite true, but I won't refuse to take whether your child be a cat or a rat." They mutually agreed on this point, and when after some months the woman gave birth to a female kitten, the man according to his promise had to take it. The man used to carry the cat tied up in a basket and slung on his shoulder. One day the string gave way and the basket dropped on a bush. On his looking to the cause of this, he found to his utter amazement that his cat became a beautiful young woman.

The plant on which the cat dropped down was therefore called 'cat's-flower' plant.\*

Please see page 186 of the book edited by an Admiral of Burmese Fleet of Royal Boats. In this book derivations and legends of Burmese common names are shown.

### USE OF THE PLANTS IN BURMA.

Specimen 1. Its use, as far as I know, is good for medicines, for removing wind in bowels and stomachs and also for stomach-aches, and for protecting children from getting bad smell. Its leaves are sometimes used in preparing broth. They are sometimes prepared as pickled tea and used as food.

Specimen 2. *Pinlé Kyaungban, Ye Kyaungban, or Sin Kyaungban.*

\* We are unable to give the Burmese word as Burmese type was not procurable in India.—HON. ED.

I never saw the plant used as a food-stuff or for internal medicine. Its green leaves are used as an application for sores and itches after grinding them properly.

Mg. Po Sein.

### **The Nilgiri Game Rules.\***

A curious case has recently been decided by the Government of Madras in connection with the Nilgiri Game Rules.

As is commonly known, a most praiseworthy and go-ahead Association, known as the "Nilgiri Game Association," has been in existence for a number of years in the Southern Presidency, its object being the preservation of the game in the Nilgiri and Coimbatore districts by limiting the number of head killed per annum and endeavouring to strictly enforce a close season for all game. To this end Government had sanctioned a set of Nilgiri Game Rules, and an annual permit costing Rs. 30 had to be taken out by all wishing to enjoy any sport in these districts. In practice these game rules had been made to apply to both shooting and fishing, and in the interests of the latter sport the Nilgiri Game and Fish Preservation Association has at great expense stocked the rivers of the plateau, which are said to have contained formerly little but minnows, with English and Carnatic carp, tench and trout. As can be easily understood, this latter proceeding was only, on the supposition, until recently never questioned, that the Game Rules did also apply to the fishing of these streams.

The annual license was formerly issued from the 1st July to 30th June, or for the fasli year. Last year the question arose as to the advisability of changing this date. It had been pointed out that a visitor arriving at Ootacamund in May on three months' leave with the intention of spending that period in fishing the streams and rivers on the plateau had under the present rules to take out a license which expired on the 30th June, and this entailed his taking out a second for the balance of his stay. In other words, a visitor's fishing cost him Rs. 60, whereas a resident would only be paying Rs. 30. At a meeting of the Association it was unanimously carried that the license should in future be made to hold good from September 16th to the following September 15th instead of the fasli year, as at present. An application to Government supported by the Collector of Ootacamund and the Conservator of Forests, Southern Circle, was accordingly sent up to Government for the necessary sanction to the alteration. The Board supported this resolution and sent it on to the Revenue Secretary. The reply from the latter was a startling one. It conclusively shows that the drawing up and putting into force of game laws to be applicable to either a part or the whole of a country like India, where their utter

\* This article has been compiled from official papers very kindly placed at the disposal of the Editor by the Government of Fort St. George.

absence from time immemorial has led to a point where we are threatened with the extinction of portions of the fauna, must be approached with great caution. That such are urgently needed and on a much larger scale than at present in force for the country as a whole few who have studied the question would be found to deny. "No law," wrote the Revenue Secretary, "or authorised rules can be traced in the Government Office requiring that a license should be taken out for fishing in waters not closed absolutely to fishing, *vide* also G. O. No. 401, dated 8th June 1894. The reason urged by the Nilgiri Game Association for changing the period of the currency of the shooting license does not therefore apparently apply. The Collector of the Nilgiris is requested to report whether any other reason subsists for the proposed charge."

This letter raised the question as to whether the fishing in the rivers of the plateau was to be licensed or not. The G. O. 401, referred to above, decided that any restriction on fishing by raising the fees would injuriously affect the professional fishermen at Mattupalaiyam, who lived by fishing and were paying a small fee of Rs. 5 to the Coimbatore Collector for the privilege, and therefore was inadmissible. Ever since the receipt of that order the Mattupalaiyam fishermen had been exercising their profession unhampered in the two rivers Bhawani and Moyar, which were the only two rivers within the limits prescribed in the "Nilgiri Game and Fish Preservation Act" II of 1871, which contained any indigenous fish capable of forming food and frequented by professional fishermen. As has been already seen, the rivers and streams on the plateau contained no such fish, nor were there any professional fishermen in those hills. It had always been considered by the Collectors of Ootacamund and by the Honorary Secretaries of the Game Association, who were District Forest Officers, that the order did not apply to the rivers of the plateau, and it was on this supposition, even though it does not appear to be very evident how it could have arisen unsupported as it appears to have been by a single official declaration in its favour, that the large sums of money were spent by the Association in stocking the plateau rivers with imported fish.

The Collector in his letter states "that it was always thought that it was never meant by Government that the fishing of these imported and costly fish should be open to everybody free of all fees." Since neither he nor the Honorary Secretaries had ever questioned the validity of the rules under whose *quasi* protection the fish had been imported, it is not very apparent what idea the Collector intended to convey by these words. The serious question which had arisen is faced, however, in para. 4 of the letter. "As it now seems that Government relies on the letter of the order, even in respect of the imported fish, I request that orders of Government may be obtained for the conversion of



the present license, *viz.*, 'to hunt and shoot' into one 'to hunt, shoot and fish' in the streams of the Nilgiri plateau (the wording might, one would think, be amended with advantage), and for the provision of power to enable me to prescribe such necessary conditions and restrictions as may be decided by me in consultation with the Nilgiri Game Association." The Conservator, in forwarding this on to the Revenue Board, pointed out that neither the Collector nor the Association had the power to legalize the prohibition of fishing in the rivers and streams of the Nilgiri plateau, but that rules could be framed by the Collector and Game Association under the Forest Acts as amendments to the present rules for hunting and fishing, which rules could be submitted for the sanction of Government.

The Board, in recapitulating the above suggestions and proposals, stated that if Government approved of the proposal in principle it would be necessary to amplify rules 4 and 5 of the special rules to regulate the pursuit of game in the Nilgiris so as to include fishing in the streams of the plateau. Sections 21 and 26 of the Madras Forest Act would cover the contemplated addition to the present rules, and as neither of these sections affected existing private rights, no harm could, in the Board's opinion, result in applying the rules now proposed. It was only, they continued, when Madras Act II of 1879 (the Nilgiris Game and Fish Preservation Act) is applied, that private rights would be affected; it was not, however, now proposed to apply that Act as the rules the amplification of which is now suggested are framed under the Madras Forest Act. With reference to the question, raised by the Conservator, as to the authority which should sanction the rules, the Board considers that the amplification of the rules now suggested by it should receive the sanction of Government, minor details, such as the conditions of the license, being left to the Collector.

In their Order No. 483 Revenue, dated 11th May 1904, Government approved of the Board's proposals, but ordered that in the *addenda* to be made to the Nilgiri Game Rules care should be taken to specify the waters which are to be closed to non-licensees: and the privileges of indigenous fishermen in the Moyar and Bhawani rivers and in other waters, which are now as a matter of fact open, should not be interfered with. As regards the conditions of the license, the form of license now issued would, they presumed, require little alteration.

This order has ended a position which might have placed the Nilgiri Game Association in a serious predicament, and the far-sighted policy in altering the fishing year so as to remove what was undoubtedly a serious hardship to visitors should, and doubtless will, meet with its just reward from those sporting visitors who belong to that fraternity who class themselves as ardent disciples of the Great Isaac.

E. P. STREBBING.

**Indian Pheasants and their Allies.**

BY F. FINN, B.A., F.Z.S.

(Continued from page 227.)

## CHAPTER IX.

## QUAILS.—(concluded.)

The quails that remain to be dealt with all agree in having distinct tail feathers, though the tail is still short and inconspicuous in all except one species.

This one is the Mountain Quail (*Ophrysia superciliosa*), in which the tail is three inches long; of the rest, the two typical bush quails (*Perdica*) are recognizable by their short, stout, almost bullfinch-like bills and their tail of twelve feathers, and the slight billed bush quails (*Microperdix*) by having a bill much like an ordinary quail's and ten feathers in the tail, which is more than half as long as the wing.

All the above birds are rather miniature partridges than quails, both in form and habits, the stout-billed bush quails especially, in which the males have a little knob on each shank, representing a spur.

## THE JUNGLE BUSH QUAIL

*Perdica asiatica*, Blanford, Faun. Brit. India, Birds, Vol. IV., p. 118.

Native names:—*Lowa*, Hind; *Juhar*, in Manbhum; *Auriconnai*, Sonthal; *girza pitta*, Telugu; *Kari lowga*, Canarese. The male of this species is brown above, mottled and pencilled with black and buff; the head is mostly of a bright chestnut with white eyebrows, and the underparts conspicuously barred across with black and white. The female has the same chestnut head, but no barring below, the whole plumage being a nearly uniform light brown.

The young have no chestnut on the head, and a brown plumage streaked with buff above and whitish below.

In all the pinion quills are plain brown on the inner web and spotted with buff on the outer.

The bill is black, the eyes brown, and the legs orange.

This, although a thick-set little bird, is decidedly smaller than the common or grey quail, being only a little over six inches long, with a wing of a little over three inches and tail about half as long.

It inhabits well-wooded tracts in the Indian Peninsula, and also in the northern part of Ceylon. It is almost always in little flocks, from half-a-dozen to more than twice that number going about together, shooting off in all directions when alarmed, but quickly collecting again. Their call is a long trilling whistle, something like that which forms so large a part of the song of the German "Roller" canaries. They live on grass-seed and

insects, and are themselves rather dry and not so good to eat as the true quails.

They breed from September to February, laying five to seven creamy-white eggs about an inch long in a nest of grass under the shelter of some bush or tussock. Although so sociable in a state of nature, they will fight in captivity, and are sometimes kept for this purpose by natives.

#### THE ROCK BUSH QUAIL.

*Perdicula argunda*, Blanford, Faun. Brit. India, Birds, Vol. IV., p. 119.

Native names:—*Lowa*, Hind. and Mahratta; *Lawunka*, Telugu; *Sinkudeh*, Tamil; *Kemp lowga*, Kanarese of Mysore. This species is very like the last, but is slightly larger, and differs in a few points in the plumage; there is more buff on the upper surface, the head is dull brick-red with no white eyebrow; the cock has broader bars below, and the hen a whitish chin and abdomen. But the chief difference is that the inner webs of the pinion quills are spotted with buff as well as the outer.

This species, like the last, is a bird of the Indian Peninsula, but has a more restricted range, nor is it found in Ceylon. It also affects more open and drier country, chiefly inhabiting sandy or rocky ground with scanty vegetation; its nest and eggs are like those of its ally, as are its general habits; it breeds in August and September and also in March.

The slight-billed bush quails, with longer tails and shorter wings than the above two species, and without spur-rudiments in the males, nevertheless closely resemble them in habits. Of the three species, two are very nearly allied, the third very distinct and formerly one of the very rarest of our birds.

#### THE PAINTED BUSH QUAIL.

*Microperdix erythrorhynchus*, Blanford, Faun. Brit. India, Birds, Vol IV., p. 121.

Native name:—*Kodai*, Tamil.

The general colour of this bird is brown warming into chestnut below, and distinctly spotted with black, the spots being especially large and bordered with white on the flanks and under the tail. The head of the cock is curiously marked with black and white, the chin, crown, and a patch round the eyes being black, while the throat and a band along each side of the head are white, the former having a black border; the hen's face is dull reddish, with no black and white markings. The legs and bill are bright red, a point which at once distinguishes this species and the next from all our other quails. Young birds are like the hen, but have the black crown, which is nearly or quite absent in females.

The cock, which is a little larger than the hen, is seven inches long, with a wing of three and-a-half inches and a two-inch tail.

This bird haunts the forests on and near the Western Ghats, and is also common on the Nilgiris, while it has been obtained on

the Shevaroy. Its call is different from that of the stout-billed bush quail, and it flies less noisily, being a softer-feathered bird. The breeding season varies, being from August to April according to local circumstances; the eggs are simply laid on the ground, are pale glossy cream colour, and measure a little over an inch in length.

BLEWITT'S BUSH QUAIL.

*Microperdix blewitti*, Blanford, Faun. Brit. India, Birds, Vol. IV, p. 122.

Native name:—*Sirsi lawa*, in the Central Provinces.

This is hardly a distinct species, differing from the painted bush quail only in being smaller and greyer, with a distinctly smaller bill and with more white and less black on the face of the male. It inhabits the forest region of the eastern Central Provinces.

HUME'S BUSH QUAIL.

*Microperdix manipurensis*, Faun. Brit. India, Birds, Vol. IV, p. 122.

Native name:—*Lanz-Soibal*, Manipuri.

One of Mr. Hume's most striking discoveries in Manipuri, this pretty quail is very distinct in appearance from all our species. Its plumage is slate colour, mottled with black above and buff below the breast, this colour broken up into large spots with black markings, which form a cross on every feather. The cock has a dark bay face, which at once distinguishes him from the hen. The bill is dark horny, and the legs orange.

In length this species is about seven inches, with a wing a little over three, and a tail of two inches.

Mr. Hume discovered this species himself when in Manipur, and obtained nine specimens (all he saw except two which were lost) after immense labour and two days' beating in an expanse of elephant grass covering broken ground about two miles square. The birds were in two coveys, and those shot were found to have fed upon both seeds and insects. A single bird was shot ten days later in the same district, and there is a specimen in the British Museum said to be from Sikkim. But except for these few specimens, nothing more was known of the Manipur bush quail till 1899, nearly twenty years after Mr. Hume's discovery of the bird, when Captain H. S. Wood, of the Indian Medical Service, presented one to the Indian Museum, and Lieutenant H. H. Turner two others. Captain Wood, who had found the species quite common in Manipur, afterwards wrote an interesting note on it in the Asiatic Society's *Journal* for 1899. He had shot about eighty of these quail, and did not consider them at all uncommon. The native name means "*Trap Quail*," as the Nagas snare numbers of them in nooses after jungle fires. The birds breed in Manipur, and the egg is large in proportion to the size of the bird, and greenish in colour with black and brown patches; unfortunately

Captain Wood's specimens of them got broken in transit. He found the birds hard to see except after the jungle fires from February to April, as they kept to dense cover, and even after a fire their dark colour made them hard to see on the burnt grass; they were always found close to water. The coveys kept very close when running, and Captain Wood has bagged as many as four at a shot.

The bird is thus pretty well known now, and what is chiefly wanted are birds in young plumage and a well authenticated set of the eggs, which would appear from the description above given to differ from those of the common painted bush quail as much as does the plumage of the parents.

The mountain quail, the last of the Indian *Phasianidæ* which I have to deal with, is still in the same cloud of mystery which enshrouded the Manipur bird till so recently; but as the little Manipuri has been brought to light, we may hope that the same will happen with the present bird.

#### THE MOUNTAIN QUAIL.

*Ophrysia superciliosa*, Blanford, Faun. Brit. India, Birds, Vol. IV., p. 105.

The Mountain quail—so called, for it is the least quail—like of all these little birds—is rather larger than the common grey quail, with a decidedly long tail for a bird of the kind, this appendage being fully as long as or longer than any ordinary partridge's, although all but covered above and below by the long tail coverts. The general feathering is also of a long type, but the wings are decidedly short, and the colouring will at once distinguish the bird from any other of the family. The cock and hen, though neither is brilliantly coloured, are absolutely unlike each other, the former being slate-grey, tinged with olive above, and with black edgings to the sides of the feathers, a black head streaked with white, and black under tail-coverts spotted with white; while the latter is brown spotted with black centres to the feathers and the face a sort of pinkish grey.

Remnants of the young plumage on some specimens in the British Museum seem to show that both sexes when young have a garb of closely mottled black, brown and buff, so that they might easily be passed over as of no particular account if the comparatively large tail were not noticed.

The bill is red, bright coral in the male and dusky in the female, and the legs are dull red. In a pair kept in England the bill and legs were yellow. The length is about ten inches, with the tail three, the wing being only three and-a-half, and the shank one.

The mountain quail was described in 1846 by J. E. Gray from living specimens in the fine collection of the Earl of Derby at Knowsley Hall, and he gave the locality as "India" with a query. Nothing more was heard of it till 1865, when Kenneth Mackinnon shot a pair in November, in a hollow between Budraj and Benog,

behind Mussoorie, at about 6,000 feet elevation. Again in November, but two years later, at least one party established themselves at Jerepani, and remained till the summer of 1868; and five specimens were procured. Then, in December 1876, Major G. Carwithen got one bird on the eastern slopes of Sher-ka-danda, close to Naini Tal, at an elevation of 7,000 feet. No specimens have turned up since. It seems to be a migratory bird, arriving in winter, although its small wings look ill-adapted for a journey of any length. It goes in single pairs or coveys, and keeps close to cover in grass jungle or brushwood, being almost impossible to flush without a dog. Its flight is heavy, slow, and short; its food, grass seeds. The call is a shrill whistle. Anyone coming across these birds again should do his best to secure a living pair or two, and either breed from them himself—which could probably be done in the hills in a well-grassed run—or send them Home to the London Zoological Gardens or down to the Calcutta Gardens. In this way eggs might be obtained, whereas we are likely to wait a long time for them if we look to the discovery of a nest in the wild state in the case of such a rare and erratic bird as this one appears to be.

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#### VI.—EXTRACTS, NOTES, AND QUERIES.

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##### **The New Hope for the West.**

PROGRESS IN THE IRRIGATION AND FOREST RESERVE MOVEMENTS  
By GIFFORD PINCHOT, Forester of the United States Department  
of Agriculture.

The first immigrants, and the trappers and fur-traders who preceded them, found a vast, strange, formidable region west of the Mississippi, which had its place in the Eastern geographies as the Great American Desert. In early days the journey across it, in the course of which whole companies of immigrants perished, was a matter of six months, and often entailed the most deadly hardships. To-day the West is no longer strange or formidable, the hardships are gone, and the Desert itself has faded from the map and from the minds of men. We have learned its uses.

As the successive waves of immigrants swept westward over the great desolation to the promised land beyond, they left pools of settlement here and there, some permanent, some destined to dry up and disappear before seasons of scanty rainfall or the new knowledge of better land elsewhere. The early settlers could pick and choose; there was comfortable land for all, and it was only a question of finding the best. But with the progress of settlement the best and then the good land was taken up; and the home-makers on the edge of the cultivable belts, and especially the women, suffered the severest trials in the process of ascertaining the fact that they could not succeed—trials of which

little knowledge has ever gone abroad. Except as the farming area is from time to time pushed forward into the arid region by new methods of cultivation or by the discovery of new grains and forage-plants better adapted to dry climates, the chances for the home-maker, otherwise than through irrigation, have been slender for years, and now they are almost wholly exhausted. The story of the struggle on the edge of the arid belt is a record of heart-breaking disappointment, and of failure for causes utterly beyond individual control. But when failure by the old methods was made certain, there came the knowledge of a better way.

"What do you do for water when it doesn't rain?" said a returned Californian ranchman to a farmer in his old home. "I wait until it does," replied his friend. "Well, I don't have to wait," said the Californian; "I carry my water in ditches, not in clouds, and I make it rain with my hoe whenever I want to."

As the irrigation idea took form and spread, the Western people, aided to some extent by federal grants of land, began to build irrigation works and to reclaim the desert. These private enterprises brought about the existence of many prosperous communities of irrigation farmers, but they seldom or never paid either interest or profit to their promoters. One enterprise of this kind created in less than twenty years, at Phoenix in Arizona, a community with taxable property to the value of over ten million dollars, without paying well enough in money to yield the original investors a cent of interest on their investment. But the limit of such development was quickly reached. What could not be done by private enterprise the nation must undertake. Steadily, therefore, but with the slowness of all great new conceptions, the idea of national irrigation grew toward a place in the national consciousness.

Long before there had come into being the knowledge of what the great West is, a movement kindred to irrigation had started into life on the Atlantic coast. The early settlers there had brought with them from Europe an inherited tendency to protect the forests. This passing survival was frequently expressed in legislation, but it was quick to disappear under the stress of frontier life. The extent of American forests, too, began to be realized, and little was heard of forest preservation from the close of the eighteenth century until after the Civil War. The war had been followed by a vast expansion of railroad-building, and that in turn by the development of our marvelously efficient systems of cutting, manufacturing, and distributing lumber. With better transportation the real attack upon the forests began, and following it came tardy efforts for their protection. Among the first results was the organization of a small scientific division of Washington to give information upon forest matters, and later, in 1891, the making of the first federal forest reserve by proclamation of President Harrison. Here was the point of departure for actual growth in national forestry.

The waves of settlement which overspread the level West broke against the bases of the wooded mountains, dashed over them in a spray of explorers, hunters, and prospectors for mineral, and retired, leaving them unsubmerged. These rocky islands in the sea of present and potential homes became the forest reserves.

At first the forest reserves were made for the general object of preserving the forests, and without specific relation to the great problems for which later they were to provide the only solution. Now they are seen to stand at the center of the public land policy of the nation, for out of them come the wood, the water, and the grass which are indispensable for the founding of homes.

The first reserves, made by President Harrison, attracted little general attention. They were followed, however, by the creation of additional reserves to the amount of more than twenty-one million acres by President Cleveland on February 22nd, 1897. This action, taken at the recommendation of a Committee of the National Academy of Sciences, was of peculiar value. It reserved great areas, the protection of which is absolutely essential to the well-being of the West, it gave the forest reserves a place in the public mind, and it laid a broad foundation for future development. Under President McKinley other reserves were created, but as yet no adequate form of management or even protection had been supplied by Congress.

When Congress met on the first Monday in December, 1901, national irrigation was still a hope, and the forest policy of the nation was still unformed. The two movements were still separate and independent, and their relation to the rest of the public land policy was by no means clear. Upon this situation came President Roosevelt's first message to Congress. In it he set the reach and meaning and the essential unity of the two movements in their true light before the nation.

"The fundamental idea of forestry is the perpetuation of forests by use. Forest protection is not an end of itself; it is a means to increase and sustain the resources of our country and the industries which depend upon them. The preservation of our forests is an imperative business necessity.

"The wise administration of the forest reserves will be no less helpful to the interests which depend on water than to those which depend on wood and grass. The water-supply itself depends upon the forest. In the arid region it is water, not land, which measures production. . . . The forest and water problems are perhaps the most vital internal questions of the United States.

"The forests alone cannot, however, fully regulate and conserve the waters of the arid region. Great storage works are necessary to equalize the flow of streams and to save the flood-waters. . . . These irrigation works should be built by the National Government."

Such support from the administration gave the Reclamation Act a new standing in Congress, and the President's personal



influence brought about its amendment in important particulars, to the hindrance of land speculation, and to the advantage of the actual settler. The Act was signed June 17th, 1902, and work under it began at once.

The passage of the National Reclamation Act marked a new era for the West. Its effect upon actual settlement may not unfairly be compared to that of the Homestead Law, signed by President Lincoln in 1862. It devotes the proceeds from the disposal of public lands to the construction of irrigation works by the National Government, and provides that the cost of these works shall be repaid by the settlers who take up the land reclaimed. What it will eventually mean I scarcely dare to predict, but some of its immediate results are obvious. In Southern California, if we count the urban and rural populations together, one and one half acres of irrigated land are required to support one person, and it is probably reasonable to expect that this area will ultimately be reduced to a single acre. But if two acres are required to support one person, the expenditure of the twenty million dollars already in the reclamation fund will in the end make homes for half a million people, the average cost of reclamation being about twenty dollars an acre. After the first expenditure the money will be repaid by the settlers, will return to the Treasury, and will then be available again for repeated use until the irrigation of all reclaimable land is achieved.

Because of the attention directed to forestry and irrigation, a new conception of public land questions, or rather of the public land question as a single problem, has been coming rapidly forward, and the vital importance of it to the nation as a whole is growing into full recognition. We are beginning to see the interdependence of its various parts, such as irrigation, forestry, grazing on the public lands, and the general problem of the best use of every part of the public domain; and the knowledge is becoming a principle of action, with the conception of permanent settlement at its base. President Roosevelt's second message contained this definite recommendation:

"So far as they are available for agriculture and to whatever extent they may be reclaimed under the national irrigation law, the remaining public lands should be held rigidly for the homemaker, the settler who lives on his land, and for no one else."

In March 1903, in an address before the Society of American Foresters, the President announced a principle which stands at the foundation of every phase of the public land policy of his administration, and especially of his policy in forestry and irrigation:

"And now, first and foremost, you can never afford to forget for one moment what is the object of our forest policy. This object is not to preserve the forests because they are beautiful, though that is good in itself; nor because they are refuges for the wild creatures of the wilderness, though that, too, is good in

itself; but the primary object of our forest policy as of the land policy of the United States, is the making of prosperous homes; It is part of the traditional policy of home-making of our country. Every other consideration comes as secondary."

Speaking of the forest policy of the Government, in the same address he said:

"And you are going to be able to make that policy permanently the policy of the country only in so far as you are able to make the people at large, and, above all, the people concretely interested in the results in the different localities, appreciative of what it means. . . . Keep in mind the fact that in a government such as ours it is out of the question to impose a policy like this from without. The policy, as a permanent policy, can come only from the intelligent conviction of the people themselves that it is wise and useful; nay, indispensable."

The progress of forestry hangs upon practical conceptions such as this. Use must be the test by which the forester tries himself, for by it his work will inevitably be tried.

The test of utility has given the forest movement and the forest policy alike new strength and new acceptance. The misunderstanding of their objects and uses, which has always been the chief local obstacle to the making of forest reserves, necessarily yields before the argument of use, which implies also that no lands will be permanently reserved which can serve the people better in any other way. Forest reserves were never so popular as they are to-day, because they were never so well understood. For this result the President's Western trip in the spring of 1903, during which he constantly advocated forest preservation for economic reasons, is largely responsible.

During the three years of President Roosevelt's administration, and thanks chiefly to his support, forestry and irrigation have made unexpected and unprecedented gains in public estimation. These gains appear especially in the respect of men practically affected, and in the progress and efficiency of Government work. A general increase in public interest in the "preservation of forests by wise use," which is forestry, accompanies the awakening of irrigators and lumbermen; and Congress shows the effect of it in greater friendliness and increased appropriations. With Congress, as well as with the lumbermen, forestry has become a live question.

National irrigation is assured, and with it the development of agriculture in its highest and most intensive form, that of the irrigated farm. Intensive cultivation leads to dense population, and that in turn to better means of communication, and to a better and more active social and intellectual life than is possible when homes are scattered and meetings difficult. Fed by the waters from the forest reserves, a new West is springing into the perpetual desert sunshine from lands once altogether worthless.

It is true, however, that far more remains to be done than has yet been accomplished. The execution of the great policy of national irrigation has but just begun. Its successful completion will require all the steadiness, judgment, and executive power of the Reclamation Service, which has been thoroughly well organized to give the policy effect. The outcome will depend, also, upon the protection of the sources of water-supply by forest reserves, for without such protection national irrigation must fail. The need for such reserves to safeguard and conserve the irrigation interests of the West is most pressing, and other interests feel a similar need. The continued productiveness of the summer ranges in the mountains, now in wide and rapid process of destruction, can be assured only by forest reserves. Both the present and the future supplies of timber over great areas in the Western States depend, not merely upon the reserves, but upon the practical and effective character of their management. There is urgent necessity for a national forest service, to be formed by the Bureau of Forestry from the consolidation of the Government forest work, now scattered among three independent organizations. Yet, in spite of all that remains undone, the work is well begun. Agitation has given place to the beginnings of practical achievement.—*The Century Magazine*.

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*School of Forestry for Ireland.*—The Department of Agricultural and Technical Instruction in Ireland have decided to establish a school of forestry in Ireland, and have purchased the Avondale estate in County Wicklow, which is to be devoted to the purposes of a forestry station.

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*Java Teak.*—Mr. Fraser, our Consul at Java, remarking on the output of Java teak (*Tectona grandis*), says that last year was a most unsatisfactory one. This was principally caused by the scarcity of labour, the large rice crop enabling numbers of the regular wood-cutters to remain in their villages without working until their supply of rice was consumed. The year was also an abnormally wet one, and therefore not in favour of the output, which is estimated at about 3,531,600 cubic feet, as against about 5,650,000 cubic feet in 1902 and 4,944,000 cubic feet in 1901. About 353,000 cubic feet were shipped to South Africa in the form of railway sleepers; the balance was exported as squares, logs, sawn wood, &c., to Europe, chiefly to the Netherlands and the United Kingdom. A few small parcels were shipped to China, and during the last few months of the year regular shipments of from 10,000 to 14,000 cubic feet were made to Bombay. It would appear that British India promises to be a good market for Java teak.

According to the latest official returns, the area of the teak forests in Java at the end of 1900 was 265,175 acres, of which 12,140 acres have been planted by the Netherlands Indian Government, the remainder being of natural growth. The average production of wood per acre may be taken at about 2,825 cubic feet.—*Timber Trades Journal*.

## VII.—TIMBER AND PRODUCE TRADE

### Denny, Mott and Dickson, Limited.

#### WOOD MARKET REPORT.

*London, 1st September 1904.*

**TEAK.**—The landings in the docks in London during August consisted of 272 loads of logs and 160 loads of planks and scantlings, or a total of 432 loads, as against 913 loads for the corresponding month of last year. The deliveries into consumption were 499 loads of logs and 289 loads of planks and scantlings—**together 788 loads, as against 885 loads for August, 1903.**

The dock stocks at date analyse as follows:—

	5,630 loads of logs, as against 5,739 loads at the same date last year.				
	3,225 „ planks, „	3,607 „	„	„	„
<b>Total</b>	<b>9,555 loads</b>	<b>9,346 loads</b>	„	„	„

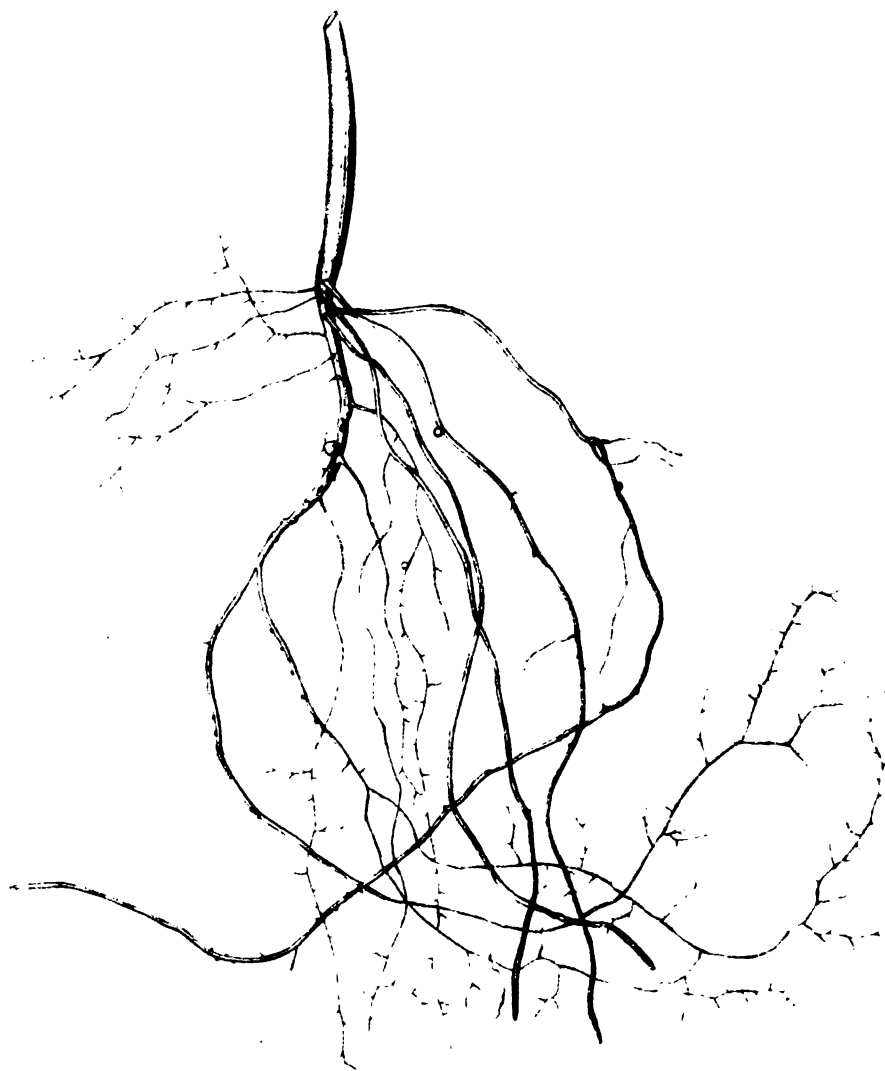
Shippers maintain their attitude of discouraging any chance of forward contracts, by not only quoting higher rates, but refusing to make commitments of any importance. There is an expectation that not only our own but Continental Admiralties will require sufficient quantities of teak to exhaust the reduced new season's output from the Indian forests, which output can only yield a small proportion of first-class European logs, and these cannot be ready for shipment before next year. The consumption, however, continues to be so restricted that the holders of stocks on this side will wait until they are much nearer the necessity of replacement than at present before they get anxious about next year's supplies.

Notwithstanding the continued depression and consequent strain in the Soft Wood trade the Hard Wood market has been in a sound, if quiet, condition, and a sober feeling that the general trade of the country being quiet the timber trade must be adjusted accordingly has helped to prevent over-trading, and considerably lessened the chance of the widening of that financial distrust which so often aggravates the disappointment and anxiety caused by a shrinkage in the volume of business.

**Market Rates for Products.***"Tropical Agriculturist," September, 1904.*

Cardamoms	...	... per lb.	1s. 3d. to 1s. 5d.
Croton seeds	...	... „ cwt.	20s. to 27s. 6d.
Cutch	...	... „ „	25s. to 30s.
Gum Arabic, Madras...	...	... „ „	15s. to 20s.
„ Kino	...	... „ lb.	2½d. to 4d.
India-rubber, Assam ...	...	... „ „	2s. 3d. to 4s. 1½d.
„ Burma...	...	... „ „	2s. to 3s. 6½d.
Myrabolans, Madras	...	... „ cwt.	5s. to 6s. nom.
„ Bombay	...	... „ „	4s. to 7s. 6d.
„ Jubbulpore	...	... „ „	4s. to 6s. 3d.
„ Bengal	...	... „ „	3s. 6d. to 5s. nom.
Nux Vomica, Cochin	...	... „ „	8s. to 10s. 6d.
„ Bengal	...	... „ „	6s. 6d. to 8s. 6d.
Oil, Lemon grass	...	... „ lb.	8½d.
Orchella weed, Ceylon	...	... „ cwt.	10s. to 12s. 6d.
Seedlac	...	... „ „	175s. to 200s.
Tamarind, Calcutta	...	... „ „	7s. to 9s.
„ Madras	...	... „ „	4s. 6d. to 6s.





Lith. by S. C. Mondul.

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## **The Study of Sandal Seedlings.**

BY C. A. BARBER, M.A., F.L.S.

It is gratifying to note that more attention is being paid to the natural history of the sandal. This is a work which has been unaccountably neglected by Forest Officers in charge of sandal nurseries and plantations, and, considering the parasitic habit of the plant, it is probably due to this neglect that their efforts have met with so little success in the past.

I see, on looking over recent files of the *Indian Forester*, that a number of papers have appeared on this interesting subject, those especially of Mr. Rama Rao, of the Madras Forest Department, showing what results can be obtained by careful observations without the use of the microscope. I would wish to draw the attention of the Mysore Forest Officers to the need of continued study on these lines if they are to be in a position satisfactorily to deal with the problems in sandalwood cultivation which are coming to the fore because of the disease in their plantations.

It has occurred to me that the following observations on seedlings may be of interest to those who are working at this subject.

From a series of pot-experiments commenced in January of this year the following interim results may be recorded:—

(1) When seeds are grown in pure sand and are suitably watered, they are able to grow for a considerable length of time. A well-developed, much-branched root system is formed. This is largely produced from the stores of nutriment in the seed, which are located after germination in the swollen hypocotyl, the "radish-like" portion found at the junction of stem and root. The root system thus formed is, as stated, much branched, and forms a fine and delicate network. Many of the finer rootlets are covered with short root hairs, although these are usually too minute to be seen by an ordinary hand lens. Certain of them develop small haustoria, also covered with root hairs, as if the plant felt its need of some outside assistance. Some of these haustoria are attached to other roots of the system, but the great majority are quite free. In two cases haustoria were firmly attached to small pebbles, and one had sucked a



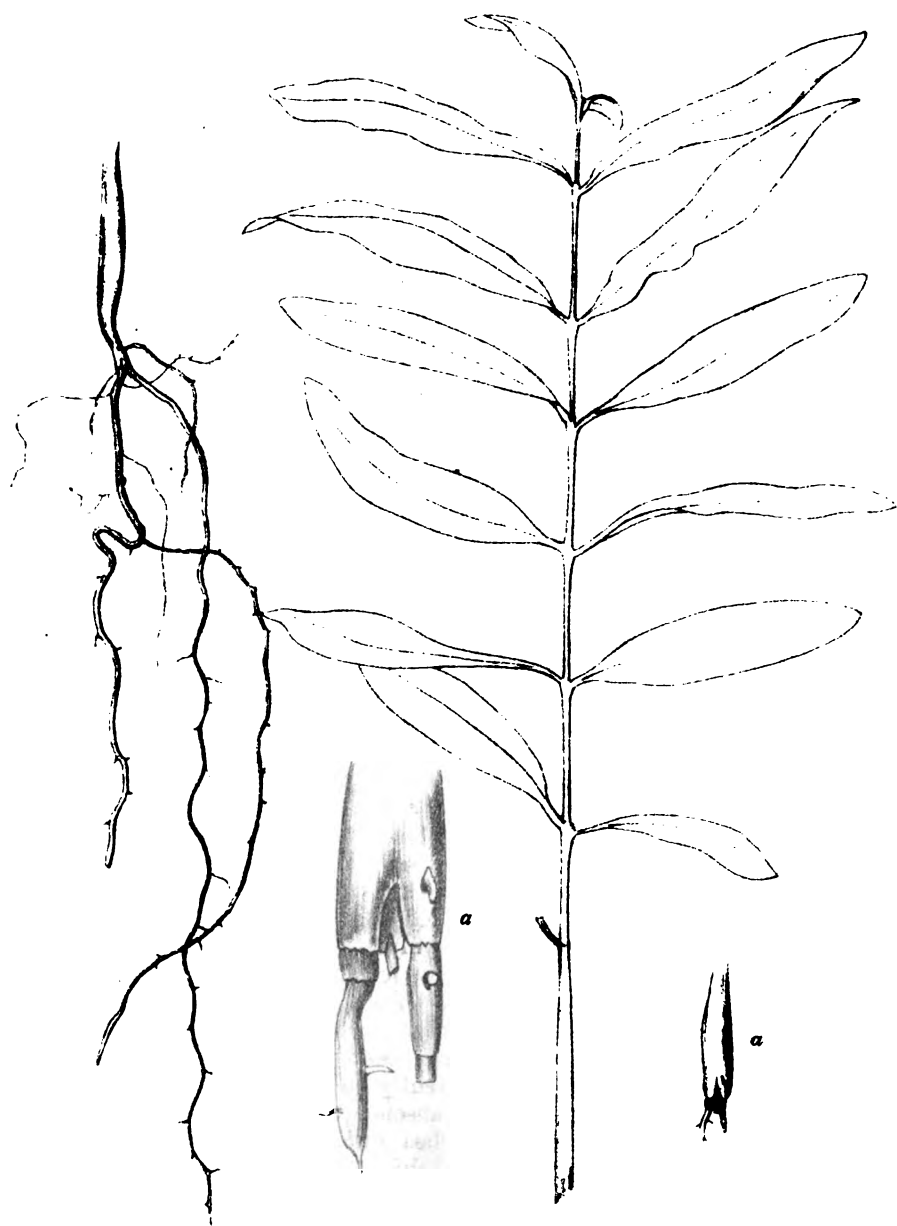
small insect chrysalis dry. From these facts it is evident that the presence, or even nearness, of foreign roots is not necessary for the development of haustoria on sandal roots.

It has also been noticed that when a rootlet commences to form haustoria, it usually does so in many places, so that rows of these are met with on certain roots while others have none. Such roots are specially suited for the study of the early differences between true root branches and haustoria. As is well known, while the latter are formed from the external layers of the rootlet, the lateral roots are formed deep in its tissues and have to push their way out. The difference is at once seen on using a hand lens of moderate power. The young haustoria are conical, frequently flattened in the direction of the long axis of the root, with a broad base; while the rootlets are more or less cylindrical and pointed. The lateral roots are furthermore seen, one and all, to have at their base a minute collar of the tissue thrust aside in their outward progress, and after death this collar is left behind and forms a characteristic scar. This is clearly shown in the figure. Bearing this in mind, it is easy for anyone armed with a hand lens to study the development of haustoria and lateral roots on sandal seedlings. It is also worthy of note that in several rootlets examined dark fungus hyphæ were found in the cortex running parallel with the long axis of the root.

Seedlings grown in pure sand are light green in colour and, although perfectly formed, are evidently not well nourished. After a while the older roots appear to decay, their ends die, and the haustoria already formed become brown and hollow. New whiter roots are then developed higher up the hypocotyl to replace them.

(2) Young plants in a mixture of vegetable mould and sand assume a darker colour and a more healthy appearance. There is little difference in the size of these seedlings and those grown in sand during the first six months, but, on pulling them out and examining the root system, this is seen to be very differently developed. Instead of the fine network of delicate rootlets, there is comparatively little branching. The roots are thicker, reminding one of those found in humus-loving plants, and there are fewer root hairs. These roots seem to be peculiarly subject to the attacks of insect enemies. In some pots every root end was found to have been destroyed as fast as it was formed, and this was apparently the work of a thin, active, long black ant. But even in the absence of insect enemies the roots were unhealthy, the branches quickly dying and leaving scars of characteristic appearance behind them all along the roots, and comparatively few healthy root ends were met with. There was a remarkable absence of haustoria of these roots, although they were very occasionally met with.

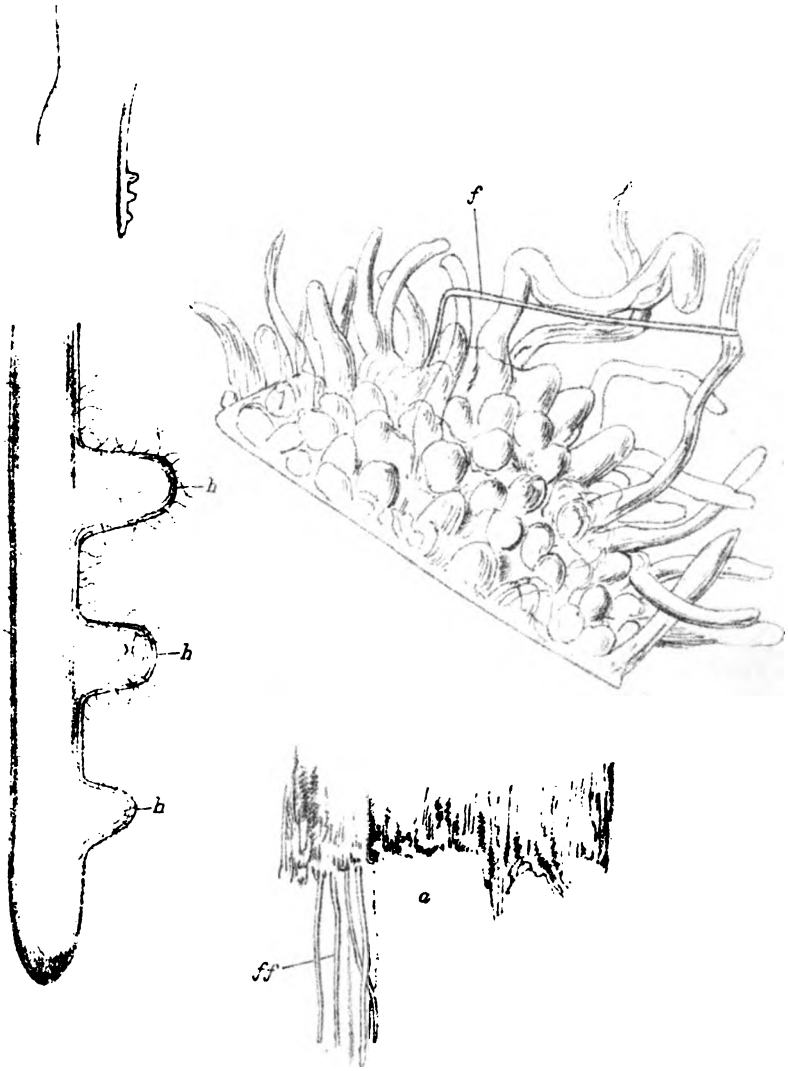
The darker green colour and more healthy appearance of these seedlings grown in vegetable mould, as compared with those













in clean sand, tend to show that, besides living largely on the food stored in the swollen hypocotyl, a certain amount of nutrition was obtained from the rich humus-bearing earth of the pots. But the root system was far from healthy, and it appears doubtful whether the planting of sandal-seed in vegetable mould by itself is a wise practice.

(3) Sandal seedlings grown in pots with well-established garden and other plants already growing in them had a root system differing little from that of the mature plant in nature. They varied greatly in the number of attachments formed, and this seemed to depend on the species of plant in whose company they found themselves. In some cases examined there were no attachments, as, for instance, in a pot full of the roots of *livistona*, a common ornamental palm. In others, seedlings only a few months old had formed numerous attachments. Such were those planted with *Pterospermum Heyneanum*, *Tecoma stans*, *Casuarina equisetifolia*, &c. It is probable that, although the seedling will attach itself to any root or, on occasion, to the most unlikely substances, the marked preference shown by the mature plant for certain roots reveals itself at an early age. Thus, connections were few and hard to find with several of the *Anonaceæ*, and all haustoria formed on *Artabotrys biglandulosa* roots had quickly died. This apparent selection is a matter well worth more extended study while considering the suitability of different plants as hosts in sandal nurseries.

(4) It has been asserted that the roots of sandal seedlings are extremely delicate, and that the greatest care must be exercised in transplanting them. This is, of course, always true of seedlings. But it does not appear to be especially the case with very young sandal. A number of six months old seedlings were re-planted after their roots had been examined and in most cases cut off. They were re-planted in pure sand, and, after a little withering, have recovered themselves and are apparently quite healthy, a month after the experiment was made.

From a consideration of these facts it would seem to be worth while determining whether in starting a sandal plantation the seeds should not be sown in the first instance, say, in tile-pots with their future nurses. And it would seem best first to establish the latter and then to sow the sandal on their roots. On transplanting the whole mass of roots would be moved, the sandal would be kept in its place by its attachments, and would probably not suffer at all in the removal.

A careful study of the whole flora of the sandal zones is indicated, and especially the determination of good hosts (*easily propagated*); it is not likely that the introduction of plants from other classes of forests will be so useful as those which have accustomed themselves for long periods to the same conditions as the sandal.



It is obvious that, without a more sympathetic study of the needs of the sandal and its very peculiar characteristics, attempts at making artificial plantations or conserving those in existence are not likely to meet with much success. And it is hoped that these few facts may be of interest to some of your readers, and perhaps may induce those interested in the propagation of this interesting plant to conduct experiments on these lines. It may be worth while mentioning in concluding that, in order to satisfactorily examine the root system of any plant and preserve the endings intact, it is necessary to take out the whole soil and very gradually wash it away from the root mass. Otherwise the extremely delicate endings and the light attachments will inevitably be broken.

#### EXPLANATION OF THE PLATES.

Plate I Root system of a sandal seedling, six months old, grown in pure sand. Haustoria are to be seen at intervals, and strong new roots are being developed from the collar.

Plate II Sandal seedling, six months old, grown in vegetation, mould and sand.

(a) The root system of a plant, apparently healthy aboveground, which has been attacked by insects.

Plate III Roots of the plant in Plate I magnified to show the differences between lateral roots (r) and haustoria (h).

Plate IV A root-end with haustoria, natural size and magnified, showing the root hairs to be found both on the surface of the roots and on the haustoria. The end of the haustorium is drawn to show the papilla-like form of the epidermal cells and the formation of root hairs.

(a) A broken piece of root is shown with hyphæ of a fungus (ff) protruding from the torn cortex of the root.

### India and the Royal Society.

A passing remark that officials in India did little to further scientific research, partly from want of leisure and opportunity, but chiefly from want of the ability and perseverance without which little headway can be made in this direction, led me to peruse the latest year book of the Royal Society of London.

To use the letters F. R. S. after one's name is to bear the hall-mark of the Scientist, and is a distinction as eagerly sought after as it is difficult to obtain.

The Society was originally founded for improving natural knowledge, and a candidate for election has to be proposed by at least six Fellows, and then subsequently has to undergo the ordeal of the ballot by which the fifteen new Fellows are chosen each year from amongst the candidates who have been proposed for election.

I have not succeeded in ascertaining the exact date of the founding of the Society, but it was in a flourishing condition in the latter portion of the Eighteenth Century, when, in 1780, some of the Fellows who were chemists founded an association, or perhaps more correctly a club, which met fortnightly at a coffee-house for the discussion of chemical subjects. Eight years later other Fellows, who were interested in Botany, founded the Linnean

Society, and later on other independent societies sprang up, each for the purpose of cultivating more especially one distinct branch of natural knowledge. Large and influential as some of those societies now are, they are all descended from one common stock, the Royal Society of London.

At present there are 465 Fellows, of whom 26 have a more or less intimate connection with India. Of these the following are less closely connected with the country :—

Sir J. Hooker (1847), Lord Ripon (1860), Sir W. T. Thiselton Dyer (1880), Sir Mountstuart Grant-Duff (1881), Sir H. H. Howorth (1893), and Lord Curzon (1898).

Hooker wrote the flora of British India; Lord Ripon was Governor-General of and, subsequently, also Secretary of State for, India.

Thiselton Dyer is the Director of Kew Gardens and a botanist of world-wide reputation. Grant-Duff, a former Governor of Madras, wrote *The Elgin Speeches* and *Notes of an Indian Journey*; and Howorth is known for his literary and archæological attainments. He is the author of *A History of the Mongols* and *The History of Chenghiz Khan and his Ancestors*. Lord Curzon has made a name as a traveller, and is the author of *Problems of the Far East*, *Russia in Central Asia*, and *Persia and the Persian Question*, the standard book on Persia. As Viceroy he is of course at present very intimately associated with India.

The remaining Fellows were or are all closely connected with India, and were admitted to the Royal Society almost entirely on account of the work done by them whilst resident in India.

The Indian Medical Service claims four Fellows :—Sir J. Fayer (1877), Cunningham (1889), Ross (1901), and Alcock (1901). Fayer was Surgeon-General, and devoted much time to snakes and their poisons. Cunningham was a Professor in the Calcutta University, and an expert in Physiology. Ross is well known in connection with malaria and the mosquito; while Alcock is Superintendent of the Indian Museum, and the Indian authority on Crustacea and Fishes.

The Survey of India numbers Thuillier (1869), a Governor and former Surveyor-General; Herschell (1871), an R. E. and late Deputy Superintendent of the Great Trigonometrical Survey of India; Hennessey (1875), one of the earliest Deputy Surveyors-General; and Burrard, the present Superintendent of the Great Trigonometrical Survey of India, whose recent researches into the cause of the declination of the pendulum in Northern India have excited the greatest interest.

Brandis (1875), Gamble (1899), and Seelich (1901) represent the Forest Service. Brandis organised the Forest Service in India, was its first Inspector-General, is a botanist of great repute, and author of *The Forest Flora of North-West and Central India*. Gamble was Conservator of Forests and Director of the Imperial Forest School, is a well-known botanist, and author of *A Manual of*

*Indian Timbers* and *A Monograph of the Bambuseæ*. Schlich was Inspector-General of Forests, and is Professor of Forestry at Cooper's Hill; a forester pure and simple, he is responsible to a great extent for the gradual awakening at Home of the public to the importance of forestry to the future of Great Britain.

Strachey (1854), Tennant (1869), and Baird (1885), of the Royal Engineers, were all well-known names in India, and did much for the country through their great engineering and irrigation works.

The Geological Department is represented by Blanford (1874) and Holland (1904). The former was head of the Department, and, on retiring, devoted himself chiefly to zoology, in which he has made a name. Amongst his chief zoological works are the *Mammalia* and *Birds* in *The Fauna of British India*, of which latter work he is Editor.

Pedler (1892) and Bourne (1895) belong to the Educational Department, the former having been a Professor of Chemistry in Calcutta, and the latter a Professor of Biology in Madras, and well known for his researches on Indian earth-worms.

John Eliot (1895) was Meteorological Reporter to the Government of India, and wrote a series of *Memoirs* dealing with storms in India and cyclones in Indian Seas.

Sir George King (1887), as Superintendent of the Royal Botanic Gardens, Calcutta, was eminent as an Indian Botanist and Quinologist, and rendered much valuable assistance to the cause of Botany and Natural History in India.

The list it is true is not a long one, but it suffices to show that amidst the pressure of official life in India there are more than a few who have, not without success, devoted much of their time, often their spare time, to the cause of scientific research.

R. MCINTOSH.

### Deodar Plantations and Aspect.

By B. O. COVENTRY, F.C.H.

THE following observations made during a tour in Jaunsar, N.-W. Himalayas, United Provinces, in May 1903, with regard to the effect of aspect on the deodar plantations at Bodyar, elevation about 8,000 feet, may be of practical interest:—

Year of planting.	Present age.	Aspect.	Soil covering.	Method of plantation work.	General appearance of plants.	Height of deodar.
1898	...	7 S.-W.	Grass only	Deodar planted about 5' x 5'	The plants are yellow and unhealthy ...	2' 6"
1897	...	8 S.-W.	Grass and shrubs.	Ditto	The plants are fairly healthy due to the protection given to them by the shrubs. The deodar plants have nearly all died, but a few have survived where they have shelter from other trees already existing. Blue pine has succeeded well, and the plants are 8' high.	3' 10"
1896	...	9 S.-E.	Grass and a few isolated trees.	Deodar planted alternately with sown patches of blue pine.	The deodar have all survived, but are yellow and unhealthy; here and there where they have shelter from shrubs they are of a good healthy colour.	3' 6"
1896	...	9 S.-W.	Grass with shrubs sparsely scattered.	Ditto	The plants are in excellent condition, of good colour, and vigorous growth. They seem to be benefited by side shelter, but are dwarfed where shade from shrubs is excessive.	3' 6"
1896	...	9 W.	Grass and shrubs.	Deodar planted 5' x 5'	The plants are in excellent condition, of good colour, and vigorous growth. They seem to be benefited by side shelter, but are dwarfed where shade from shrubs is excessive.	5' 0"
1892	...	13 S.-S.-W.	Grass only	Ditto	The plants are yellow and unhealthy ...	5' 6"
1892 (Asmari)	...	11 S.-W.	Grass and shrubs.	Deodar and blue pine sown in mixture.	On exposed places the deodar has failed, but under protection of shrubs it has succeeded. Blue pine has succeeded everywhere.	3' 0"
1892 (Asmari)	...	11 N.-E.	Ditto	Ditto	Both species have succeeded, but the blue pine has attained a height of about 12' and is suppressing the deodar. The deodar are still healthy and only require more light by cutting back the blue pine.	4' 0"
1891	...	24 N.-E.	...	Deodar planted 6' x 5'.	The plants are in excellent condition.	20' 0"

NOTE.—The plants put out into the forest were two years old, which accounts for the present age being two years more than the plantation.  
The elevation in all cases is about 8,000 feet above sea level. The soil is much the same in all the plantations, being naturally somewhat better on the cooler aspects, but is good enough in all the plantations. Gradient is steep, about 30°-40°.

The above notes show that on the hot southern aspects the plantations were not successful unless the transplants were planted under the shelter of some shrub or tree already existing on the ground. The plantation of 1896 was particularly instructive, as planting was carried out at the same time on different aspects: on the south-east aspect the deodar plants had died with the exception of a few plants which had the protection of trees or shrubs; a little further on, after turning to a south-west aspect with shelter from trees and shrubs, the deodar plants had survived, but were mostly yellow, except where they had ample shelter, in which case they were healthy and growing well; further on still, on a west aspect, the deodar plants were all thriving, and of a good healthy colour.

The plantation of 1892 at Asmari was also a very interesting one: sowings were made of mixed deodar and blue pine seed. On the south-west aspect the success is indifferent: the blue pine has succeeded, but the deodar has failed, except in a few cases where the young plants have grown under the shelter of trees or shrubs already existing on the ground. On the north-east aspect both the blue pine and deodar have succeeded, but the latter is being suppressed by the blue pine (the deodar having a height of about 4 feet and the blue pine about 12 feet). Another portion of this Asmari plantation consists of a dense growth of indigofera coppice with deodar plants well distributed below it. The Forest Guard informed me that this area was treated by cutting back the indigofera close to the ground and sowing deodar seed. The indigofera has outgrown the deodar and retarded its growth; but at the same time there appears every probability that the deodar will free itself without artificial assistance. This is interesting because it tends to show that indigofera coppice of the same age as deodar will give the necessary shelter without suppressing the deodar altogether.

From the above notes we may draw the practical conclusion that if bare grassy slopes with hot southern aspects are to be stocked with deodar it is necessary to, first of all, bring on to the ground some other species to act as nurses, under whose shelter deodar can afterwards be introduced.

The best manner of introducing nurses requires further experiment. It does not appear to give satisfactory results to sow blue pine seed simultaneously with the planting of deodar nor with the sowing of deodar, as in both these cases the deodar failed. If blue pine is to be used as a nurse, it will probably be necessary to give it several years' start before introducing deodar, but in this case care will be required in preventing the suppression of deodar. To avoid this difficulty it may be more advisable to use shrubs, such as indigofera, desmodium, dentzia, rubus, rosa, &c., as nurses; but this is mere speculation, and only careful and systematic experiments will give the necessary information. Such experiments as these would be most satisfactorily carried

out by a special research bureau, the necessity of which is constantly being brought forward.

In conclusion it may be added that in all the plantations referred to above the transplants used were "basket plants," so that the question of bad planting as a cause of failure need not be considered, and we may fairly assume that the differences in the success of the plantations were due mainly to the different aspects, the other conditions of locality being much the same in all cases. It must be borne in mind that the different aspects simply mean different exposures to heat and light, and that the above remarks only apply to localities similar to that of Bodyar, namely, elevations of about 8,000 feet on the outer hills of the Himalayas.

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### Pioneers of Indian Forestry.

CAPTAIN FORSYTH AND THE HIGHLANDS OF CENTRAL INDIA.

(Continued from p. 499.)

As we have already seen, the Pachmari plateau was fixed upon to form the centre of the forest operations to be undertaken by Forsyth, and a Forest Lodge, the pioneer of the bright little station which now forms the summer headquarters of the Central Provinces Administration, was to be erected in this beautiful spot—the heart of the country of the Gonds and Korkus—the plateau sacred to the deity Siva. A conception of awe and mystery had always been associated with the lofty peaks which culminate in this plateau, and embosomed among them lies one of the most sacred shrines of the god, to which at least one pilgrimage is necessary in the life of every devout Hindu. But, excepting at the appointed season for this pilgrimage, no dweller of the plains would venture, at the time of which I am writing, to set his foot on the holy soil of Mahadeo's hills. This was the cause of considerable trouble to Forsyth, and he mentions that, as he approached its neighbourhood, gloomy looks began to gather on the faces of his followers, whose fears had been acted upon by the conversation of the people they had met. The usual excuses were put forward—the road was represented as impassable from natural difficulties, and it was guarded by wild beasts, goblins, and fell diseases. *Tempora mutantur!* The apprehensions of his men did not daunt Forsyth, and he reached the plateau, which he describes as bearing the aspect of a fine English park, the plain being dotted with giant trees of barrá (*Terminalia Chebula*), jámun (*Eugenia jambulana*), and the mango. Arriving in the evening, our traveller saw, through the vista of the trees, three great isolated peaks appear, glowing red and fiery in the setting sun against a purple background. The centre one of the three was Mahadeo, deep in the bowels of which lies the shrine of the god himself, being supported

on the left by Chauradeo, and on the right by Dhupgarh, the highest peak of these Central Indian highlands.

In his first ramble over the plateau Forsyth mentions an interesting fact. His dogs put up and he shot a fine specimen of the solitary or wood snipe (*Gallinago nemoricola*), which he says is rare in Central India, he having only met with it once in the Mandla district. He considered that this was the bird which stood for the woodcock in the stories told of the latter's occurrence in the Central Provinces; for, although he had hunted for this bird at every likely spot in the hills, he had never met it. It would be interesting if sportsmen in these parts would let us know whether subsequent researches have borne out this contention.

On Forsyth's arrival on the plateau he found two small settlements of Korkus thereon, one consisting of about 30 houses at Pachmari itself, with a Thakur as the head of it. The area of the plateau is about 12 square miles, and the scene from it is thus described:—"To the south, as far as the eye can see, lie range upon range of forest-covered hills, tumbled in wild confusion. To the east a long line of rampart-like cliffs marks the southern face of the Mahadeo Range, the deep red of their sandstone formation contrasting finely with the intense green of the bamboo vegetation out of which they rise. Here and there they shoot into peaks of bare red rock, many of which have a peculiar and almost fantastic appearance, owing to the irregular weathering of their material—beds of coarse sandstone horizontally streaked by darker bands of hard, vitrified, ferruginous earth. Looking across this wall of rock to the north-east a long perspective of forest-covered hills is seen, the nearer ones seeming to be part of the Pachmari plateau, though really separated from it by an enormous rift in the rock, the further ranges sinking gradually in elevation, till, faint and blue in the far distance, gleams the level plain of the Nerbudda valley. Standing on the eastern edge of the plateau, again, the observer hangs over a sheer descent of 2,000 feet of rock, leading beyond in long, green slopes down to a flat and forest-covered valley. Its width may be six or seven miles, and beyond it is seen another range of hills rising in a long, yellow, grass-covered slope, dotted with the black boulders and ending in the scarped tops that mark the trap formation. That is the plateau of Motur, with which the general continuation of the Satpura Range again commences (after the break in it occasioned by the Mahadeo group). On this side the forest that clothes the valley and the nearest slopes present a very dark green and yet brilliant colouring, which will be noted as differing from the vegetation in any other direction. This is the sal forest which forms the singular outlier far to the west of the line which otherwise limits the range of that tree in Central India. It fills this valley of the Denwa almost to the exclusion of other vegetation, and, creeping up the ravines, has occupied also the south-eastern portion of the plateau itself." Such was the country

in which Forsyth had come to work; and he was met, as many another Forest Officer has been met, with the obstruction and delays so often experienced by men in a similar situation in India. The Thakurs, probably foreseeing that this was the first step towards the opening out of the solitudes to Western civilization and progress, resented the appearance of this Pioneer of the Forest Department, and placed every obstacle in the way of the erection of the Forest Lodge, and his difficulties might have proved well nigh insuperable had he not been favoured by two things. Owing to the failure of the previous harvest there was very considerable scarcity amongst the wild tribes. Their system of cultivation was the one then appertaining to all the forest tribes of India, that of jhuming. They possessed no cattle or ploughs to break up the soil with, and therefore left untilled such rich areas as the fine open plateau of Pachmari, preferring the shifting method which consisted in felling an area of forest, burning it over, and raising two or three crops in the ashes of the burnt trees, and then moving on to a fresh area. This, with a few pumpkins and creeping beans reared about the houses, were all they troubled to grow. They eked out their means of subsistence by adding, whenever possible, animal flesh. Animals of all sorts would pay visits to the jhumed areas, and by means of traps and the village *shikari* they managed to procure their destruction at times. In addition, they used to hold several grand drives in the forest yearly; and of their fondness for this form of sport Forsyth, who was himself an enthusiastic sportsman, soon took advantage to gain the goodwill of the tribes and get workers. Their system of cultivation (if such a word can be used for one of the most ruinous forms of agriculture which man ever devised or put in force) was, of course, of the most precarious character. The holding off of rain for a few weeks after the seed was sown, or when the ear was forming, meant ruin to the whole, and the owner was then compelled to depend for his subsistence entirely upon the wild fruits, roots, and products of the forest. Nature has been very bountiful in these forests in her supply of food for their wild denizens, and it is to be hoped that the march of Western civilization will not lead them to despise and so forget these products of Nature, upon which scarce four decades ago their forefathers so often had to almost entirely depend for their living in years of failure of the crops. Many species of tree and bush ripen a wholesome and palatable fruit in their season, and these were supplemented by roots. The mohwa flower (already alluded to), the plum of the ebony (*Diospyrus melanoxylon*), the fruit of the wild mango, the berries of the chironji (*Buchanania latifolia*), and the ber (*Zizyphus jujuba*), the seeds of the sal, the bean of the giant *Bauhinia* creeper, &c., are eaten; also a species of wild arrowroot and a sort of wild yam are dug up. The rare seedling of the bamboo was a godsend to them, and from the way Forsyth



writes of this it would appear that he had seen one, and a successful one. The tribes have a proverb that this portends a failure of the crops, and this was certainly the case in 1900, a year of famine, when the bamboo flowered over 1,200 square miles in the Chanda district. The eagerly-looked-for bamboo seed was never garnered in, however, for a bug\* appeared on the scene and prevented the ripening of the seed. Forsyth noted that, in addition to the large annual drives in the forests the tribes also captured many small fish in the mountain streams, chiefly by poisoning the pools with various vegetable substances, a species of strychnos being one of them. Even at that period the hillmen who lived in the neighbourhood of the plains went to cut the crops of the plainsmen after cutting their own dhyas, but the genuine hillmen of the interior would have nothing to do with such work, and often suffered severely in times such as those at which Forsyth appeared amongst them. As I have said, our Pioneer was a sportsman, and he soon saw a method of bringing round the tribes, probably the only method by which he could have won them over. He sent down to the nearest market and purchased a store of wheat and millet, and issued shooting invitations to all the Gonds and Korkus chiefs of the neighbourhood with their followers, and every available man in the hills was sent for to beat. A store of grain was despatched to the site selected to feed them all, and one of the Pachmari grog-shops was taken down bodily. Many a Forest officer of the present day has doubtless often found that the way to get his work done, and done cheerfully, is by following Forsyth's plan. The great drive came off. A number of animals were killed, and a heavy dinner was followed by the monotonous singing and dancing to which these tribes are addicted, and which, with the help of the tom-toms and shrill bamboo flute, flanked by the mohwa spirit and pipe, is usually kept up the live-long night through. Two days after the great orgie parties of the hunters began to drop in, and the work on the Forest Lodge commenced and went on intermittently, for regular work was not to be expected from these hill tribes (one of the difficulties so often facing the man who has to deal with these forest tribes and quite unrealized by those who have not been in contact with these men), to its completion.

After seeing the Lodge well under weigh Forsyth visited the sal forest in the Delakari valley, to the east of Pachmari, one of the few forests in that part of the country which had escaped destruction at the hands of the timber speculator and dhya cutter, it being inaccessible to the former and unsuitable from its level character and the size of the trees to the operations of the latter. The trees of this forest bore every appearance of being fully mature, but the largest averaged no more than six or eight feet in

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\* *Ochrophara montana* Distant. Vide Department Notes on Insects affecting Forestry, No. 1, p. 123.

girth, whilst most of them, subsequently cut down, were found to be almost useless from heart shake and dry rot. A lease of this forest for Government was soon concluded, and a road laid out connecting it with the open country. It was here that our Pioneer shot two does of the 12-tined deer (*Rucuirri duvanallii*), an animal which, like the sal forest in which it lives, had been supposed not to extend to the west of the sal belt in the Mandla District. He was not lucky enough to shoot a stag, but saw a frontlet in possession of a native *shikari* and heard of a fine stag being shot by a Railway Engineer; they were evidently not numerous however. He also found that the red jungle-fowl of North-Eastern India (*G. Gallus*) inhabited this sal forest and the hills around it, though otherwise not found west of the Mandla sal belt, *G. sonnerati*, properly belonging to Western and Southern India, being also met with in the Pachmari hills. Two species of spur fowl, *Galloperdix spadicea* and *G. lunulata*, the chikara gazelle, and the little four-horned antelope also frequented this part of the hills. Tigers rarely appeared on the plateau, and lions were equally scarce. Bison were, of course, plentiful on the hills and in the valleys.

Having seen the Forest Lodge in a fair way to completion, Forsyth started off on the first of many long journeys of exploration among the forests of the Seoni, Chindwara, and Betul Districts. These are situated upon the great central tableland, with an elevation of 2,000 feet, which consists of a great overflow of basalt, the only interruptions being the Mahadeo sandstone block and a few isolated granite peaks. This great volcanic region, which is by no means level, having been denuded by the larger streams to a depth of 1,000 feet, may be termed the region of the teak tree in Central India. The tree does not strictly confine itself to the trap formation, nor is it the only, or even the principal, species. The distinction is, however, marked enough to warrant the inference that there is some link of connection between them. Whilst Forsyth found that the teak was scattered more or less all over this region, he noted that the principal forests were found clinging to the skirts of the higher ranges rising from the general area of the plateau, the more extensive level portions having been long cleared of jungle for cultivation purposes. For a long way round these settlements the forests had been hacked down into mere scrub for the common requirements of timber and fuel of the people. The outer slopes of the plateau, towards the lower plains, had been swept long before of all valuable teak, probably, owing to their sterile nature, at no time a large quantity. Even in the higher and more secluded tracts where he found forests of teak still remaining the number of mature and well-grown trees had been reduced to a very small proportion of the whole, so small that it was considered that in few places were there more remaining than would suffice to reproduce the forests naturally in a period of 50—100 years. He

found the trees growing everywhere in patches in mixture, the chief other hard woods being the Saj, Pentaptera, Bijasal (Pterocarpus), Dhaora (Canocarpus), Anjan (Hardwickia). He states that the mature teak attained a girth of from 10 to 15 ft. with a bole of 70 ft. to 80 ft. to the crown. "Perfect specimens," he wrote, "are rare, the majority of such trees as remain having suffered injury in the sapling stage from fire or axe so as to permanently contort their form." Forests containing any great numbers of tolerably good trees were extremely few, the trees having been indiscriminately hacked down for centuries. At the same time, owing to its coppicing power, our Pioneer observed that the teak was present in the state chiefly required by the population, i.e., as poles, for this coppice attained a height of 25'-30' in five years with a girth of 1' or 2', and these were all that the people required for their house-building, in which large timber had no place. "It was thus perhaps scarcely very surprising that when we suddenly demanded from the forests a large and permanent supply of big timber for railway purposes we found that they could not supply it."

Forsyth has some criticisms well worthy of consideration. "Our treatment of this question of the teak forests is a good example of the difficulties in Indian administration which arise from inaccurate information on the real requirements of the country and the obstacles in the way of reconciling the conditions of a low and almost stationary stage of society with 19th Century progress. In the cry for great timbers for our railways we totally forgot, or neglected, this demand of the masses of the population for small timber for their houses and many other purposes. We shut up every acre of teak-producing country we could, and referred them to inferior woods, all the best species, besides teak, having been reserved along with it." Noting that the pollarded teak will not grow straight and large, but having grown to a certain size (the size required by the natives) it then decays and twists into every variety of tortuous shapes, Forsyth continues: "What we should have done was to reserve the best forests for timber purposes proper and apply to the rest—the vastly greater part of them—only such measures as would ensure the best and quickest production of coppice wood for the requirements of the people. It has been said that they should do as European nations do—convert large trees to smaller scantlings by the saw, as more timber is obtained from a forest of large trees. Theoretically it is true enough, and in the distant future it may be realised. But in the meantime the people have not the capital nor do the large trees exist." Forsyth had not received the professional training of a forest officer, but we cannot but think that he was born with an intuitive perception of the principles of true forest conservancy, which must make the needs of the population, present and future, their first consideration, and entirely subordinate to annual surpluses.

Perhaps the commonest species of tree in this vast teak region is the Salei (*Boswellia thurifera*), with a soft, spongy wood useless for timber and which had also been rejected for firewood. Forsyth states that it produces an excellent charcoal and is adapted for most ordinary purposes of fuel, and he points to this as "another mistake in our Indian Forestry. Undoubtedly this and other soft wood trees should have been forced into common use by the people as fuel long ago, instead of giving way to their outcry for hard woods and bamboos, the use of which should be confined to certain special requirements." These great desolate tracts of *Boswellia* forest greatly impressed the explorer, and he remarked that should some of the properties of the tree assume commercial importance the supply would be practically unlimited, since stakes stuck in the ground in the rainy season rapidly take root and shoot into trees. He was acquainted with some of its economic characters. It yields a fragrant gum resin which is burnt as incense in Hindu temples. This was long thought to be the Olibanum of the Ancients, employed for a similar purpose. Its Sanscrit name *labana* still closely resembles that of the Ancients, and Forsyth was not inclined to consider, as suggested by others, that our knowledge of the ancient commerce of the country sufficed to exclude India from the list of countries which contributed the frankincense of the *Boswellia* to the fanes of heathen gods. He was also of opinion that the soft woody fire of the tree would be adapted for the manufacture of coarse paper or cloth. The country about the Tapti River furnished a specimen of this *Boswellia* forest; and very stiff such a country is to get about in.

On the subject of forest fires the following remarks are of some interest:—"The grass being universal in the jungles of these provinces is undoubtedly beneficial in a great variety of ways. It allows and assists by the manure of the ashes a crop of green and tender grass shoots to appear for the vast herds of cattle which form the great part of the wealth of the people in the neighbourhood of jungle tracts. It kills multitudes of noxious insects and snakes. It probably prevents much malaria that would arise from the vegetation if gradually allowed to decay. It destroys much of the harbour for wild beasts. And the ashes no doubt form a valuable ingredient in the deposits of soil carried down by the drainage of these hills to lower regions, and in the cultivable crust forming in these uplands themselves. It has been held by some that these fires are very injurious to the growth of saplings of teak and other valuable trees. But it is an undoubted fact that teak seed will germinate and produce seedlings when the grass has been fired better than when it has not; and it is not well established that much permanent injury is afterwards done to the seedlings." It will probably be of interest to Burma foresters, now engaged in considering this question,

to read an opinion on the subject written over four decades ago.

Forsyth gives rather a graphic picture of what the exploration of these forests meant. "The labour of exploring such forests during the hot season when alone they are sufficiently open and free from malaria is immense—day after day toiling over those interminable basaltic ridges, where many marches have to be made without meeting an inhabitant, without often a single green tree for shelter, and dependent for water on a few stagnant pools puddled up by the feet of wild animals. This was what often fell to the lot of the forest officers of those early days. I doubt if many of them would have gone on with the task but for the love of sport and adventure which probably led to their original selection of a jungle life, and there is not one of them whose health did not, after a few years, give way under the combined assaults of malaria and a fiery sun." There are few of us perhaps even at the present day to whose minds on reading these lines vivid memory pictures of such days as Forsyth describes will not arise.

Amongst the animals found in the teak region the bison, sambhar, spotted deer, barking deer, and four-horned antelope are mentioned. The hog deer did not, he thought, occur so far to the south-west as the trap country.

Having explored the teak area Forsyth next turned his attention to the sal forests of the tract assigned to him, commencing from Mandla. Above this latter place the valley of the Nerbada opens out into a wide upland country, the main river between this and Jubbulpore here radiating like the fingers of a hand and draining the rainfall of an extensive triangular plateau, the Mandla district. These converging valleys, known as the Banjar, Halon, Phen, Khormer and Amarkantak (chief source of the Nerbada), respectively, rise in elevation towards the south, where they terminate in a transverse range of hills, the Maykat Range, which overlooks to the south the flat country of Chhattisgarh. This tract contains within its outer circle of hills an area of not less than 7,000 square miles, much of it of a broken and unculturable character. The Maykat Range and the radiating spurs which separate the plateau are mostly clothed with sal forest which almost monopolises the parts where it grows. The saj (*Terminalia tomentosa*) alone grows in any quantity with it. Some of the hills are covered with the ordinary species of forest trees of other parts where the geological formation is not the one favoured by the sal. The valleys are fairly open and free of all undergrowth and dotted here and there by hills and islands of sal. This country has a much less arid character than that previously explored, as the sal tree, being practically an evergreen, the forests have always a beautifully cool, fresh appearance. Our Pioneer also found the climate of the uplands much more temperate, the thermometer showing a mean of 77° during the hot season, but ranging from about 50° to 100° in night and day temperatures.

Except close to Mandla, the country was scarcely populated at all when Forsyth visited the town, at one time the seat of one of the Gond Rajput ruling dynasties, the remains of whose forts still crown, in crumbling decay, the top of many a forest-covered mound. The Gonds were here a very poor and subdued race, practically serfs in the hands of the money-lenders who speculated in the produce they raised. Far superior to them were the still utterly unreclaimed forest Bygas, an aboriginal race inhabiting the hills of the Mykat Range and its spurs. The same tribe extends over a vast range of forest-covered country to the west of Mandla under the name of Bhumias. These Bygas are very black, with an upright slim wiry frame, and show less of the negretto type of feature than any other of these wild tribes. They wear only a small strip of cloth with, in full dress, a coarse cotton sheet worn cross-wise over the chest, and carry coal black hair in a long tangled mass. Their arms consist of a bow and arrow, in which they are very expert, and a small keen little axe. Dhya cultivation was the only form of agriculture they practised, and their habitations were neat bamboo wicker work erections pitched far up on the hill side. Of a true forest stock and full of courage, the Byga knew not fear and would attack any forest animal. In the pursuit of game they used poisoned arrows, merely cutting out the discoloured portion of the flesh round the arrow wound of the animal killed, holding that the rest is wholesome food.

Forsyth found that the Byga was the most terrible enemy to the forests existing anywhere in his tract of country. Thousands of square miles of sal forest had been clean destroyed by them in the progress of the dhya cultivation, the ground being subsequently occupied with a dense scrub of low sal coppice springing from the stumps. In addition the largest trees had been everywhere girdled to allow the gum resin of the sal (the "dammer" of commerce) to exude. This ringing of the sal trees was one of the first things prohibited in the Government areas, but continued for long afterwards in the Native States, and is probably still a practice in such of these latter as have been left by the contractor with any trees worth ringing. The dammer together with lac dye was collected, in exchange for salt, beads and arrow poison, by traders who annually visited the hills for this purpose. It was the one and only commercial transaction of the Byga in the whole year.

To its remarkable reproductive power Forsyth attributed the fact that the sal tree was not exterminated in these tracts by its relentless enemy. "The inborn destructiveness," he remarks, "of these jungle people to trees is certainly very extraordinary; even where it is clearly against their own interest, they cannot apparently refrain from doing wanton injury. A Gond or a Byga passing along a pathway will almost certainly, and apparently unconsciously, drop his axe from the shoulder on any young sapling that may be growing by his side, and almost everywhere young trees so situated will be found cut half through in this manner." A

great patience and several generations are necessary before this kind of thing will be entirely stopped. Besides lac the cocoons of the wild tussar silk-moth (*Antheraea mylitta*) were collected in great number for sale to the caste of silk spinners who lived by this business in the villages in the plains. The insect lived chiefly on the *saj*, and the trees of this species grown near the villages were pollarded to provide sufficient fresh foliage for the larvæ. In addition to this scanty exportation of the minor produce of the forests the only other economic use to which they were put in the years before Forsyth's arrival on the scene was the splendid grazing they afforded for countless herds of cattle annually brought to them during the hot season from great distances in the open country on both sides. Fine grass and abundance of shade and water made this one of the finest grazing countries in all India, and Forsyth notes that the amount of wealth which thus actually seemed to depend on its continuance as a waste appeared very great. At first sight, he says, some hesitation might be felt at the prospect of these great grazing grounds being reclaimed for cultivation when it is considered how all-essential to the life of a country like India is the breeding of large stocks of oxen for draught purposes. Certainly any measure which would be likely to endanger the existing supply of plough cattle would be highly objectionable. But I think, he continues, that no apprehension of the sort need be entertained from the probable reclamation of such tracts as the Mandla savannahs. Sufficient forest land must always remain in the higher regions to furnish the green bite at the end of the hot season, which is all that is necessary to tide the herds over the most trying part of the year, and for the rest, the people will soon learn to do as other countries have done, and as other parts of India even have done, namely, to devote a part of the cultivated area to the raising of green pasture for the cattle by irrigation. This fine natural pasture is no doubt a great advantage; but it is not at all indispensable even in India. When Forsyth penned these lines he had had a very considerable experience first as a Forest Officer and then as a Settlement Officer, but even after this he did not fully realise that this particular question was to prove one of the greatest difficulties of the Department, and that the education of the people in this direction would be a terribly slow business.

The resources of the country in iron and other mineral wealth had never been fully examined in those days, the gold-washing out of the sands of the streams scarcely repaying the labour.

Forsyth had one or two suggestions to make with reference to the utilisation of these great waste tracts. He thought that it would pay to import some of the teeming millions of the coast districts to furnish labourers for reclaiming the waste instead of transporting them to the West Indies, the Mauritius and

other distant countries as had already been done in his time. Another suggestion was that cattle breeding would furnish most promising openings as the absence of labour and roads would be of less consequence.

The highlands of Central India may perhaps properly be said to terminate where the steep southern force of the Mykal Range, trending away to the north-east, culminates in the high bluff promontory of Amarkantak. From this height of 4,000 feet the eye embraces a view of three-fourths of a circle uninterrupted by anything but the blue haze of the distance. To the east and north, 2,000 feet below, appears a flat sea of greenery, broken here and there by an isolated peak. In the faint distance beyond rises another wall of rock visible only on a clear day as a faint violet-coloured shade across the sky. The green plain is a vast forest of sal unbroken by tillage and scarcely inhabited by man, in the time of which I am writing, and after his work in the Mandla district was finished, Forsyth started on a six months' exploration of this vast region of sal forest. Over all this country the wild buffalo roamed, and in the forests north and east of Amarkantak were then found herds of wild elephants, which descended at the ripening of the crops of Chhattisgarh to the skirts of the forest, doing immense damage and forming a serious obstacle to the cultivation of the country. To penetrate to their haunts, ascertain their number and propose means for their destruction was another of the explorer's objects on this expedition. At the end of January he descended the Rajadhar Pass from the Mandla district and marched across the Chhattisgarh plain, where antelope, duck, snipe, etc., afforded plenty of occupation for the sportsman. Here he met the Chief Commissioner's camp, and thence proceeded to the eastern and southern forests. Whilst he never allowed himself to linger for sport, he says that the herds of buffalo were in some parts of this country so numerous that it would have been almost impossible to avoid encountering them.

The party sailed down the Mahanadi to Sambalpur in two days and a night after leaving the high road between Raipur and this station, the boat consisting of a long canoe hollowed out of a sal tree. "After resting a while at this most secluded of stations (they get their supplies from Calcutta, several hundreds of miles away, on men's heads, and a convoy had just been trampled up by wild elephants before we arrived) we started for the Garhjat States, where the next month was spent in unremitting toil among their rugged hills." He was here among the Khond aborigines, and he expresses a wonder that they could ever have been confounded with the Central Indian Gond, the former being of a much lower type. He returned from this trip with most of his followers severely ill of fever contracted in the close forests "where water is so scarce and bad at this time of year (April) that we rose, like river gods, from our daily bath hung with the green slime of the fetid pools from which our supplies were drawn."



Marching northward he entered the valley of the Jonk River, a tributary of the Mahanadi, and found that it was mostly devastated by dhya cultivation. Leaving it he proceeded along the Mahanadi and its tributary the Arpa to the civil station of Bilaspur, which he reached on 28th April. It was here that the arrangements were made for his expedition to the elephant haunts of the great sal forest to the north of this station. It was reported to be scarcely inhabited except by a few utterly savage Bhumias, and it was certain that no supplies of any sort would be procurable. Such was the then land-locked condition of this fertile country that as much wheat, gram and rice as were required were purchased at the rate of about 100 lbs. for a shilling. Forsyth was very nearly prevented from seeing the elephant country at the outset, as at the end of the first two marches he went down with a fever which, at the end of two more, declared itself as small-pox. So determined was he to see this country if possible that he refused to return to the station, and instead got carried to the top of a conical hill, crowned by a fortress, called Iaäfagarh, which had an elevation of about 2,450 ft. Here he stayed till the 15th May, and rapidly recovered from the attack, taking, as he says, no medicine save seidlitz powders. As soon as he could move at all he descended the hill and marched on an elephant for Matin. Here our Pioneer had a relapse, but when in a few days news was brought in of a fine tusker being within half a mile of the camp, he managed to climb on to his pony 'to at least see him,' as he puts it. Government had prohibited the shooting of cow and young elephants, but not the old tuskers. But for a stupid *contretemps* Forsyth would have bagged this tusker, which was a well-known customer and a rogue of the worst description. Losing this animal was a great disappointment to him, as neither he nor his soldier companion ever had another chance at one. Marching due north from Matin to Amarkantak the country was so level and the prospect so circumscribed by the never-ending array of great gray sal stems that it was very easy to lose one's way. The small population which existed subsisted entirely on what they shot, with their bows and arrows, and the roots and fruits of the jungle; they had no cultivation. They collected the 'dammer' from the sal to barter for the few necessaries they required of the trader. Forsyth found that owing to this scantiness in the population the sal forest had escaped much of the devastation it had suffered where the tribe was more numerous and when it was cut down for dhya cultivation. Only the oldest trees which, if not cut down, would soon become useless from heart shake and dry rot were ringed for the dammer. This great tract was remarkable for the absence in it of animal life in the hot season. It being quite level, with a light porous soil in the summer, no water is found on the surface although, the soil is full of moisture. The footmarks of a few four-horned antelopes, the voice of the cuckoo in the early morning, and rare glimpses of some

hornbill or woodpecker were all the animal life Forsyth saw whilst marching through this tract. He found it very difficult to ascertain distances, the Bhumias' 'coss' being a very variable quantity, the basis being the distance a yell can be heard from a hill top. Thus their long measure becomes—

2 yells	...	... = 1 daab (or "bittock")
2 "bittocks"	...	... = 1 coss
12 coss	...	... = 1 day's march

which seemed, he says, to be about 30 miles!

So far as they could learn, an area of about 1,200 square miles was occupied by herds of wild elephants, whose number was estimated to range from 200 to 300. These undoubtedly did very severe damage to the crops of the neighbourhood, and for many years the annual tribute of the Thakurs whose possessions they disturbed had been remitted on this account. After a good deal of reporting and correspondence the Government of India was induced to send down a Keddah establishment, which attacked these herds during the years 1865--67.

On the 1st June Forsyth climbed the steep ascent leading to Amarkantak from the east. He was still very ill and weak and had to march on an elephant, and tempted by the coolness of this elevated region to stay and rest; but the clouds banking upon the horizon threatened the commencement of the rains, and he determined to march straight to Jubbulpore by the direct road to the north of the Narbada. "That frightful march still lives in my dreams. In the first ten days we kept to the elevated country south of the river, which we then crossed. The country to the north is an utterly bare sheet of black basalt without a field or tree....The sun was at its hottest. Day after day we toiled along in the fierce heat pitching in a burning plain, without a particle of shade, and I really thought that before we reached Jubbulpore on the 16th July I should have had to sit down decently and give up the ghost. I had marched close upon 1,000 miles in changes of camp alone since I left the station in the preceding January. How much more should be added for our explorations it would not be easy to say." The Forest Pioneers were a fine lot of men, and we, their successors, cannot but feel proud to follow in the footsteps of such as they, amongst whom Forsyth was one of the brightest examples. That was to be his last march as a Forest Officer. Broken in health he went home on furlough soon after, and on his return was made Settlement Officer of Nimar. In both branches his work excelled; and in taking leave of him we cannot do better perhaps than quote one last passage from his book—that book which is so much a part of himself.

"The Government of India have been fully awakened to the necessity of watching over the important part of their trust

## A Contribution to the Forest Flora of the Jubbulpore Division, C. P.

(Continued from p. 514.)

(73) ODINA WODIER. Vern. *gunja*.

**Fl. March. Young foliage May-June.**

- (74) **SEMECARPUS ANACARDIUM.** Vern. { *Bhilāwan.*  
*Bhilwān.*  
*Kohukā* (Gondi).

**Fruit ripens April.**

Coppices well, shoots eight years old and 20 feet in height having been measured.

- (75) **MANGIFERA INDICA.** Vern.  $\left\{ \begin{array}{l} \text{Am.} \\ \text{Markā (Gondi).} \end{array} \right.$

## The mango.

F. B. I. II. 13. Br. 125.

**Fl. January—March. Fruit ripens May-June.**

- (76) *BUCHANANIA LATIFOLIA*. Vern.  $\left\{ \begin{array}{l} \text{Chār.} \\ \text{Sareka (Gondi).} \end{array} \right.$

F. B. I. II. 23. Br. 127.

Fl. January-February. Fruit ripens April-May.

Young foliage May-June.

The fruit has a delicious flavour and is most refreshing on a hot May day. The kernel of the fruit (*chironji*) is also largely eaten.

#### MORINGEAE.

- (77) *MORINGA PTERYGOSPERMA*. Vern. *munga*.

F. B. I. II. 45. Br. 129.

Fl. cold season.

Cultivated near villages.

#### LEGUMINOSAE.

- (78) *INDIGOFERA PULCHELLA*. Vern.  $\left\{ \begin{array}{l} \text{Birhol} \\ \text{Jitra.} \\ \text{Jirīla.} \end{array} \right\}$  (Gondi).

F. B. I. II. 101 Br. 136.

Fl. January. Fruit hot season.

- (79) *SESBANIA AEGYPTIACA*. Vern. *Jait*.

F. B. I. II. 114., Br. 137.

Commonly planted near villages and in gardens.

- (80) *S. CANNABINA*.

F. B. I. II. 115.

A shrubby plant, often gregarious in water on the edges of tanks and reaching a height of 10 to 15 ft. Fruit cold season.

- (81) *S. ACULEATA*.

F. B. I. II. 114.

A tall shrubby plant, a weed of damp fields. Flower and fruit found January.

- (82) *MILLETIA AURICULATA*. Vern. *guhālāri*.

F. B. I. II. 108. Br. 138.

Common in sal forests.

Fl. August. Fruit February.

Bark used for poisoning fish.

- (83) *ABRUS PRECATORIUS*. Vern. *gūnchi*.

F. B. I. II. 175. Br. 139.

Fruit ripens cold season.

- (84) *ERYTHRINA SUBEROSA*. Vern. *haruwa*.

F. B. I. II. 189., Br. 140.

There appear to be two distinct varieties of this tree in this locality. The one which is commonly seen near villages and on good deep soil has a very corky bark

pale yellowish in colour, with deep cracks. This variety retains its leaves until January-February. The other variety is commonly found wild in the forests, on dry rocky hills, and has a distinctly different appearance. Its bark is far less corky, reddish-brown, yellowish or greenish in colour with longitudinal white cracks. The leaves are shed early in autumn, about October, and the young foliage does not appear till next rains.

Both varieties flower March-April, when they are leafless, and fruit ripens May-June, but the corky variety is usually somewhat later than the other.

I have unfortunately been unable to get complete specimens of both varieties, and am unable to say whether the differences noticed are merely caused by a change in the locality or not, but the trees are certainly very distinct in general appearance.

- (85) BUTEA FRONDOSA. Vern.  $\left\{ \begin{array}{l} \text{chiola} \\ \text{mur (Gondi).} \end{array} \right.$

F. B. I. II. 194. Br. 142.

Fl. March. Young foliage April.

Fruit ripens April-May.

Lac is here largely cultivated on this tree. The fibre from the roots is very widely used. The young shoots and leaves are rarely eaten except by buffaloes, and not extensively by them, unless no other fodder is available. The tree is common on black soil, but also thrives and is gregarious upon the low rocky hills of metamorphic rock, which are very characteristic of the central portion of the Jubbulpore district.

- (86) B. SUPERBA. Vern.  $\left\{ \begin{array}{l} \text{bhador chiola.} \\ \text{bhauria chiola.} \\ \text{bhadrosi.} \end{array} \right.$

F. B. I. II. 195 Br. 143.

Flowers March. The masses of silvery, tomentose green pods, covering the bare branches of tall deciduous tree, are a noticeable feature in these forests in April-May.

- (87) FLEMINGIA STROBILIFERA. Var *bracteata*.

F. B. I. II. 227., Br. 143.

Common in *sal* forest.

Fruit cold season.

- (88) F. LINEATA. —

F. B. I. II. 228. Br. 143.

Small shrub of hedgerows.

Fl. cold season. Fruit February-March.

- (89) *PUERARIA TUBEROSA*. Vern. *bilaikand*.  
 F. B. I. II. 197., Br. 141.  
 I have seen tubers believed to be this species, but I have personally never found the plant.
- (90) *ONGBINIA DALBERGIOIDES*. Vern.  $\begin{cases} \text{tinas.} \\ \text{tinsa.} \end{cases}$   
 F. B. I. II. 161. Br. 146.  
 Fl. March. Fruit April-May before the leaves.  
 Reproduces well from rootsuckers and is occasionally found practically pure on old abandoned fields. Also coppices well. On 13th June 1901 I measured tinas coppice shoots of 6 ft. in height, on an area felled on the 3rd March 1901. The young leaves and shoots are greedily eaten by deer and cattle.
- (91) *SPATHOLOBUS ROXBURGHII*. —  
 F. B. I. II. 193., Br. 143.  
 Fruit found December.
- (92) *DALBERGIA LATIFOLIA*. Vern.  $\begin{cases} \text{shisham.} \\ \text{shishawan.} \\ \text{sisōn.} \end{cases}$   
 F. B. I. II. 231. Br. 148.  
 Not common, and usually of small size
- (93) *D. SISSOO*. Vern. *Sissu*.  
 F. B. I. II. 231., Br. 149.  
 Planted at Jubbulpore and a few other places.
- (94) *D. PANICULATA*. Vern.  $\begin{cases} \text{dhoben.} \\ \text{pānsi.} \end{cases}$   
 F. B. I. II. 236 Br. 150.  
 Fruit cold season.
- (95) *D. LANCEOLARIA*. —  
 F. B. I. II. 235. Br. 151  
 Flowers in April and young foliage appears about the same time. Fruit ripens January. Not common.
- (96) *D. VOLUBILIS*. Vern. *birach*.  
 F. B. I. II. 235. Br. 152.  
 Fl. February. In shady forests.
- (97) *PTEROCARPUS MARSUPIUM*. Vern. *bija*.  
 F. B. I. II. 239. Br. 152.  
 Young foliage June. Fl. in rains.  
 Widely distributed but nowhere plentiful.
- (98) *PONGAMIA GLABRA*. Vern. *kanji*.  
 F. B. I. II. 240 Br. 153.  
 Young foliage April and flowers shortly afterwards.  
 Fruit ripens following April. Old leaves shed March;  
 commonly planted in avenues.

- (99) *CÆSALPINIA BUNDOCCELLA*. Vern. *gatāran*.  
 F. B. I. II. 254. No. 156.  
 Fl. rains. Fruit ripens February.  
 Common near villages in hedges.
- (100) *C. SEPIARIA*. Vern. *kirkich*.  
 F. B. I. II. 256. Br. 156.  
 Fl. cold season. Common in hedges.
- (101) *C. PULCHERRIMA*. Vern. *newaria*?  
 F. B. I. II. 255. Br. 157.  
 Cultivated near villages.  
 Fl. cold season.
- (102) *POINCIANA REGIA*. The gold mohur.  
 F. B. I. II. 260. Br. 157.  
 Common in gardens.
- (103) *PARKINSONIA ACULEATA*. Vern. *dakhani bamura*.  
 F. B. I. II. 260. Br. 158.  
 Cultivated in gardens.  
 Fl. cold season—Fruit February-March.
- (104) *BAUHINIA MALABARICA*. Vern. *amta*.  
 F. B. I. II. 277. Br. 159.  
 Fruit found cold season; said to flower April-May.  
 Leaves are acid.
- (105) *B. RACEMOSA*. Vern.  $\left\{ \begin{array}{l} \text{ashto.} \\ \text{mohala.} \\ \text{daurera.} \end{array} \right.$   
 F. B. I. II. 276. Br. 159.  
 Fruit cold season, sometimes remaining on the tree as late as April.
- (106) *B. PURPUREA*. Vern. *keolar*.  
 F. B. I. II. 284., Br. 160.  
 Fl. cold season. The green pod usually bears characteristic splashes of red or purple colour.
- (107) *B. VARIEGATA*. Vern.  $\left\{ \begin{array}{l} \text{kachnār.} \\ \text{mohala.} \end{array} \right.$   
 F. B. I. II. 284. Br. 160.  
 Fl. Feb-March before the new foliage. Pods without the red splashes of colour of last species, and ripen April-May.
- (108) *B. RETUSA*. Vern. *thaur*.  
 F. B. I. II. 279. Br. 161.  
 Fl. November-December. Not common.
- (109) *B. VAHLI*. Vern.  $\left\{ \begin{array}{l} \text{mohalain.} \\ \text{paur (Gondi).} \end{array} \right.$   
 F. B. I. II. 279. Br. 161.

Fl. April-May, the festoons of white flowers, hanging on the bare branches of the deciduous trees, being then a noticeable feature of these forests. The pods are roasted in the fire and the seeds then eaten. Heaps of empty charred pods which have been thus treated are frequently met with.

- (110) *TAMARINDUS INDICA*. Vern.  $\left\{ \begin{array}{l} \text{imli.} \\ \text{chitta (Gondi).} \end{array} \right.$

F. B. I. II. 273. Br. 163.

Young foliage May and flowers about the same time; fruit ripens following March-April. Commonly planted.

- (111) *CASSIA FISTULA*. Vern.  $\left\{ \begin{array}{l} \text{jhagaruwa} \\ \text{rela.} \\ \text{kirwāra.} \end{array} \right\}$  (Gondi.)

F. B. I. II. 261. Br. 164.

Flower and young foliage May-June. The tree is then a beautiful spectacle with the dark red-brown and fresh green of the young leaves contrasting with the magnificent racemes of bright yellow flowers. Pods ripen cold season, but often remain on the trees as late as April.

- (112) *C. SOPHERA*. Vern. *bara chakaora.*  
*etikol.*

F. B. I. II. 262.

Large undershrub. Fl. rains; fruit cold season.

The dried stems are used for splitting stone by burning in quarries.

- (113) *C. TORA*. Vern. *chakaora.*

F. B. I. II. 263.

Fl. rains; fruit cold season; common weed of waste places.

- (114) *C. SIAMEA*.

F. B. I. II. 264.

Common in gardens and avenues in Jubbulpore.

Fl. rains.

- (115) *C. GLANCA*.

F. B. I. II. 265.

Planted in gardens.

- (116) *MUCUNA PRURIENS*. Vern. *kiwānch.*

F. B. I. II. 187.

Fl. rains; fruit November—March.

- (117) *SARACA INDICA*.—

F. B. I. II. 271. Br. 166.

Cultivated in gardens. Fl. March.

- (118) *MIMOSA RUBICAILIS*. Vern.  $\left\{ \begin{array}{l} \text{eil.} \\ \text{narisānp (Gondi).} \end{array} \right.$

F. B. I. II. 291. Br. 172.

Fl. in rains.



- (119) *ALBIZZIA ODORATISSIMA*. Vern.  $\begin{cases} \text{bānsa.} \\ \text{erma.} \end{cases}$   
 F. B. I. II. 299. Br. 175.  
 Young foliage in April. Pods remain on the trees till April. Good clean poles are often seen in dry rocky situations rising above the general level of the low scrubby growth around.
- (120) *A. PROCERA*. Vern.  $\begin{cases} \text{gurār.} \\ \text{kirangi (Gondi).} \end{cases}$   
 F. B. I. II. 299. Br. 175.  
 Common near streams.  
 New foliage in April. Fruit cold season, pods remaining on trees till April.
- (121) *A. LEBBEK*. Vern. *siris*.  
 F. B. I. II. 298. Br. 176.  
 Common in avenues and gardens.  
 Fl. and young foliage April. Pods ripen cold season and remain on trees till April.
- (122) *ACACIA FARNESIANA*. Vern.  $\begin{cases} \text{gandharri.} \\ \text{gandhila bamura.} \end{cases}$   
 F. B. I. II. 292., Br. 180.  
 Fl. December—February; cultivated near villages.
- (123) *A. ARABICA*. Vern. *bamura*.  
 F. B. I. II. 293. Br. 180.  
 On black cotton soil. Common in avenues, hedges and near tanks. Fl. in rains. Fruit ripens April-May.
- (124) *A. FERRUGINEA*. Vern.  $\begin{cases} \text{bara khair.} \\ \text{garkhair.} \end{cases}$   
 F. B. I. II. 295. Br. 185.  
 Only found twice, in the teak area on trap.
- (125) *A. LENCOPHLOEA*. Vern. *reonjha*.  
 F. B. I. II. 294. Br. 184.  
 Common on black cotton soil.
- (126) *A. CATECHU*. Vern. *khair*.  
 F. B. I. II. 295., Br. 186.  
 Fl. and young foliage May-June.
- (127) *A. CAESIA*. Vern. *gurār*.  
 F. B. I. II. 297. Br. 189.  
 Fl. April-May. Fruit cold season. Is essentially a strong climber, but can support itself in the open. It, together with the next species, forms a large proportion of the open, scrubby, thorny forest characteristic of the drier portions of the laterite and Vin-dhyān sandstone areas. In such situations, in the absence of other species on which to climb, the *gurār* is sometimes found standing alone and erect in the open and I have found a small erect tree of this species 15 ft. in height.

- (128) A. *PENNATA*. Vern. *ramna*.  
 F. B. I. II. 297. Br. 189.  
 Fl. rains; fruit cold season.  
 With the last species, is very common on the Vindhyan sandstone and the laterite. It is at once distinguished from *gurār* by the fact that its leaves have an acid taste, its foliage is a paler and more yellowish-green in colour, and its pods are dark-straw-coloured, whereas those of *gurār* are almost black.  
 In this locality the climbing habit of this species is not very pronounced. It is usually a straggling shrub, or small erect tree. It is often found standing alone in the open, quite erect, and I have measured a small tree of this description 18 ft. in height and 18 in. in girth. The old bark is very like that of *khair*.
- (129) A. *CONCINNA*.  
 F. B. I. II. 296. Br. 188.  
 Fl. March. The thick pods ripens December—February.  
 In hedges near villages Not common.
- (130) *DESMODIUM GANGETICUM*.  
 F. B. I. II. 168. Br. 146.  
 Under shrub of shady forests.
- (131) D. *LAXIFLORUM*.  
 F. B. I. II. 164.  
 Undershrub of shady forests.
- (132) D. *PULCHELLUM*.  
 F. B. I. II. 162. Br. 145.  
 Common in *sal* forests.
- (133) D. *GYRANS*.  
 F. B. I. II. 174. Br. 146.  
 In *sal* forests. Fruit cold season.
- (134) *CHOTALARIA SERICEA*. Vern. *bansan*.  
 F. B. I. II. 75.  
 Stout undershrub. Fine yellow flowers December-January.
- (135) C. *JUNCEA*. Vern. *san*.  
 F. B. I. II. 79.  
 Widely cultivated.
- (136) *CAJANUS INDICUS*. Vern.  $\left\{ \begin{array}{l} \text{thur.} \\ \text{arhar.} \end{array} \right.$   
 F. B. I. II. 217.  
 Widely cultivated. An attempt was made a few years ago to propagate lac on this plant in the forest villages of this Division, as is done in Assam. The seed lac was tied on the *arhar* plants in October-November, but although the insects swarmed out satisfactorily and began to form incrustations, they perished in all cases before the incrustations had become of any size,

probably owing to the rapid liquefaction of the tissues of the *arhar* shoots.

(137) *PSORALEA CORYLIFOLIA*.—

F. B. I. II. 103.

An erect herbaceous plant of hedges, with firm branches.  
Fl. February.

(138) *TERAMNUS LABIALIS*.—

F. B. I. II. 184.

Slender climber. Fruit cold season.

(139) *DOLICHOS LABLAB*. Vern. *sem*.

F. B. I. II. 209.

Widely cultivated. Fl. cold season.

(140) *ALYSICARPUS RUGOSUS*. Var. *Heyneanus*.

F. B. I. II. 159.

Large herbaceous plant of waste places.

(141) *ATYLOSIA CRASSA*. Vern. *bansem*.

F. B. I. II. 213.

Small twiner. Fl. cold season.

(142) *CYLISTA SCARIOSA*.—

F. B. I. II. 219.

Fl. cold season.

ROSACEAE.

(143) *ROSA INVOLUCRATA*.—

F. B. I. II. 365. Br. 199.

Cultivated in gardens.

Fl. March.

(144) *ERIOBOTRYA JAPONICA*. The Loquat.

F. B. I. II. 372.

Cultivated in gardens.

(145) *PRUNUS PERSICA*. Vern. *aru*.

The Peach.

F. B. I. II. 313. Br. 191.

Cultivated in gardens.

COMBRETACEAE.

(146) *COMBRETUM OVALIFOLIUM*. Vern.  $\left\{ \begin{array}{l} \text{hathisandan.} \\ \text{dimarbola.} \end{array} \right.$

F. B. I. II. 458.

A robust creeper, sometimes covering other trees and shrubs, at others forming thickets by itself on the banks of streams and ravines. Fl. April. Old leaves shed February-March before the appearance of the flowers and turn red before falling.

(147) *TERMINALIA BELERICA*. Vern. *bahera*.

F. B. I. II. 445. Br. 222.

Fl. April; fruit ripens cold season. Young foliage April-May.

Good, straight, clean poles are often seen in low scrub jungle in dry, rocky situations.

- (148) *T. CHEBULA*. Vern. *harra*.  
 F. B. I. II. 446. Br. 223.  
 Fl. and young foliage April. The young leaves are usually fully developed by the end of April, and the characteristic pale green *harra* foliage is then very noticeable in these forests when the majority of other trees are bare.  
 This tree is commonly found on a yellow soil, which is believed to contain a good deal of iron and which may be found overlying trap, laterite, sandstone or even metamorphic rocks. Probably the most characteristic *harra* areas are the open, park-like "forests," which cover the extensive plateaus, on the trap hills of the Mandla district, in this Division. The trees stand a considerable distance apart and are of moderate height but with fine large crowns, fully developed on all sides, which in a good year bear a "bumper" crop of myrabolans. Fruit ripens October—December. The young immature fruit which first falls is said to be used in medicine.
- (149) *T. ARJUNA*. Vern. *koha*.  
 F. B. I. II. 447. Br. 224.  
 Common by streams. In damp places never quite leafless, elsewhere leafless April-May. Fl. June.
- (150) *T. TOMENTOSA*. Vern.  $\begin{cases} \textit{saj.} \\ \textit{maru} \end{cases}$  (Gondi).  
 F. B. I. II. 447. Br. 225.  
 Flowers and young foliage in June.  
 Shows best growth on heavy soil, where it is often associated with *Anogeissus latifolia*. The wood is here scarcely used, although formerly it is said to have been esteemed for building, etc.
- (151) *ANOGEISSUS LATIFOLIA*. Vern.  $\begin{cases} \textit{arna} \\ \textit{dhawa.} \end{cases}$  (Gondi).  
 F. B. I. II. 450. Br. 227.  
 Young foliage May-June; old leaves dark red before being shed in February.  
 Best growth on heavy soil.
- (152) *A. SERICEA*. Vern. *kardhahi*.  
 Br. *Indian Forester*, Vol. XXV, p. 297. Fl. and young foliage March-April; fruit May. Fairly common on the black soil and alluvial tracts in valleys, among the trap hills. Attains a considerable size, a tree measured by me, near the Narbada, having a girth of 11 ft. at chest height and a clean bole 25 ft. in height.
- (153) *QUISQUALIS, INDICA*.  
 F. B. I. II. 459. Br. 220.  
 Common in gardens.

## MYRTACEÆ.

- (154) *PSIDIUM GUAVA*. Vern. *bihī*.  
F. B. I. II. 468. Br. 232.  
Widely cultivated.
- (155) *EUGENIA JAMBOLANA*. Vern. *jāmun*.  
F. B. I. II. 499. Br. 233.  
Fl. March-April, and leaves renewed at the same time.  
Fruit rains.
- (156) *E. HEYNEANA*. Vern.  $\begin{cases} \textit{jamnera.} \\ \textit{kut jamun.} \\ \textit{halka jamun.} \end{cases}$   
F. B. I. II. 500.  
Young foliage March-April.  
Fl. April-May.  
Common along water-courses and on river banks, where it is gregarious.
- (157) *CAREYA ARBOREA*. Vern. *kumhi*.  
F. B. I. II. 511. Br. 236.  
Fl. and young foliage March-April. Young leaves at first purple.

## LYTHRACEÆ.

- (158) *WOODFORDIA FLORIBUNDA*. Vern.  $\begin{cases} \textit{dhawai.} \\ \textit{surteli (Gondi).} \end{cases}$   
F. B. I. II. 572. Br. 238.  
Flowers March; used for dyeing.
- (159) *LAWSONIA ALBA*. Vern. *mendhi*.  
F. B. I. II. 573. Br. 238.  
Commonly planted in hedges.
- (160) *LAGERSTROEMIA PARVIFLORA*. Vern.  $\begin{cases} \textit{lenria.} \\ \textit{seji.} \end{cases}$   
F. B. I. II. 575. Br. 239.  
Fl. and young foliage April-June. Fruit ripens cold season and remains on the tree, sometimes as late as April. Is not eaten by cattle. Best growth on slopes and is very common on laterite. Coppices well; shoots 6 ft. in height were measured on the 13th June 1901 from stools cut on the 3rd March 1901.
- (161) *L. INDICA*.—  
F. B. I. II. 575. Br. 240.  
Common in gardens, with pink, white and purple flowers.
- (162) *PUNICA GRANATUM*. Vern. *anār*.  
F. B. I. II. 581. Br. 241.  
Cultivated in gardens.

## CUCURBITACEÆ.

- (163) *MOMORDICA CHARANTIA*. Vern. *karela*.  
F. B. I. II. 616.  
A common climber cultivated in villages.

## SAMYDACEÆ.

- (164) *CASEARIA TOMENTOSA*. Vern.  $\left\{ \begin{array}{l} \text{bheri.} \\ \text{banbheri.} \\ \text{tunrni.} \end{array} \right.$   
 F. B. I. II. 593. Br. 243.  
 Fl. February-March. Fruit ripens May.
- (165) *C. GRAVEOLENS*. Vern. *girchi*.  
 F. B. I. II. 592. Br. 243.  
 An elegant small tree with somewhat pendulous branch-  
 lets.

## PASSIFLOREÆ.

- (166) *CARICA PAPAYA*. Vern. *papaya*.  
 F. B. I. II. 599. Br. 244.  
 Cultivated in gardens. Fruit ripens April.

## CACTEÆ.

- (167) *OPUNTIA DILLENII*. Vern.  $\left\{ \begin{array}{l} \text{nāgphani.} \\ \text{sanph phani.} \end{array} \right.$   
 F. B. I. II. 657. Br. 245.  
 Common in hedges and near villages. Run wild.

## CORNACEÆ.

- (168) *ALANGIUM LAMARCKII*. Vern. *akol*.  
 F. B. I. II. 741., Br. 250.  
 Flowers April, when leafless.

## RUBIACEÆ.

- (169) *ANTHOCEPHALUS CADAMBA*. Vern. *kadam*.  
 F. B. I. III. 23. Br. 261.  
 Planted near villages and in avenues.
- (170) *STEPHEGYNE PARVIFOLIA*. Vern.  $\left\{ \begin{array}{l} \text{kaim.} \\ \text{keim.} \\ \text{mundi (Gondi).} \end{array} \right.$   
 F. B. I. III. 25. Br. 262.
- (171) *ADINA CORDIFOLIA*. Vern.  $\left\{ \begin{array}{l} \text{haldu.} \\ \text{kaim.} \\ \text{keim.} \end{array} \right\}$  Gondi.  
 F. B. I. III. 24. Br. 263.
- (172) *HYMENODICTYON EXCELSUM*. Vern.  $\left\{ \begin{array}{l} \text{biharuk.} \\ \text{mahuwa kārār.} \end{array} \right.$   
 F. B. I. III. 35. Br. 267.  
 Fruit cold season ; remaining long on the tree. Leaves  
 turning yellow before being shed in December.
- (173) *WENDLANDIA EXSERTA*. Vern.  $\left\{ \begin{array}{l} \text{tilban.} \\ \text{telen.} \\ \text{telman.} \end{array} \right.$   
 F. B. I. III. 37. Br. 268.  
 Fl. March.  
 Common on broken ground near watercourses.

- (174) *GARDENIA TURGIDA*. Vern. *karhār*.  
F. B. I. III. 118. Br. 270.
- (175) *G. LATIFOLIA*. Vern.  $\begin{cases} pāphar. \\ pāpra. \\ paniabīlo \text{ (Gondi).} \end{cases}$   
F. B. I. III. 116. Br. 271.  
Flower and young foliage June.
- (176) *RANDIA ULIGINOSA*. Vern.  $\begin{cases} bhirāra. \\ katūl. \end{cases}$   
F. B. I. III. 110. Br. 273.  
Common in *sal* forests.
- (177) *R. DUMETORUM*. Vern. *mainhar*.  
F. B. I. III. 110. Br. 273.  
Flowers June. Common in *sal* forests.
- (178) *IXORA PARVIFLOHA*. Vern. *kau*.  
F. B. I. III. 142. Br. 275.  
Fl. March-April; sweet scented; fruit ripens May.
- (179) *HAMILTONIA SUAVEOLENS*. Vern. *bhowarmāl*.  
F. B. I. III. 197. Br. 278.  
Flowers November-December; common in dry places,  
especially on trap.

## COMPOSITÆ.

- (180) *VERNONIA ROXBURGHII*.  
F. B. I. III. 232.  
Undershrub; common in *sal* forests.
- (181) *V. DIVERGENS*. Vern. *mohṭi*.  
F. B. I. III. 234.  
Common undershrub of shady forests, the long drooping  
leaves turning purplish-red before being shed. Gre-  
garious.
- (182) *BLUMEA JACQUEMONTII*.  
F. B. I. III. 265.  
Coarse shrubby herb. Fl. February.
- (183) *VICOA AURICULATA*.  
F. B. I. III. 297.  
Herbaceous weed of waste places. Fl. February.
- (184) *GONIOCAULON GLABRUM*.  
F. B. I. III. 377.  
Large herbaceous weed of waste places. Fl. Feb-  
ruary.

## PLUMBAGINÆ.

- (185) *PLUMBAGO ZEYLANICA*.  
F. B. I. III. 480.  
Undershrub of shady forests. Fl. February.

## MYRSINEÆ.

- (186) *EMBÉLIA ROBUSTA*. Vern.  $\left\{ \begin{array}{l} \textit{baibarang.} \\ \textit{baibirangan.} \\ \textit{dulduli.} \end{array} \right.$   
 F. B. I. III. 515. Br. 284.  
 Fruit cold season.

## SAPOTACEÆ.

- (187) *BASSIA LATIFOLIA*. Vern.  $\left\{ \begin{array}{l} \textit{mahaua.} \\ \textit{iru (Gondi).} \end{array} \right.$

F. B. I. III. 544. Br. 289.

Fl. March-April. The young crimson-coloured leaves appear towards the end of April. In the north of the area there are considerable tracts, included in village lands, where the scattered *mahua* trees, with their magnificent crowns, remind one strongly of the oaks in an English park. The flower is of course a valuable commercial asset, and there are many open areas, included in the forests of this Division, which, if devoted to the formation of the *mahua* and *harra* "parks," which are so often met with in village lands outside the Reserves, would eventually prove the most valuable areas in the forests. The reproach, which is sometimes brought against the Forest Department, of keeping good cultivable soil within the Reserves without making use of it, or obtaining any considerable revenue from it, would then also be impossible.

- (188) *MIMUSOPS HEXANDRA*. Vern. *khirni*.

F. B. I. III. 549. Br. 291.

Wild, but not common near watercourses. Cultivated.

- (189) *M. ELENGI* Vern. *bho. sari*.

F. B. I. III. 548. Br. 293.

Cultivated in gardens.

## EBENACEÆ.

- (190) *DIOSPYROS TOMENTOSA*. Vern.  $\left\{ \begin{array}{l} \textit{tendu} \\ \textit{tumri (Gondi).} \end{array} \right.$

F. B. I. III. 564. Br. 294.

Young foliage April-May.

- (191) *D. MONTANA* Vern.  $\left\{ \begin{array}{l} \textit{Patwan} \\ \textit{patoh.} \end{array} \right.$

F. B. I. III. 555. Br. 296.

Fl. April.

## OLEACEÆ.

- (192) *SCHREBERA SWIETENIOIDES*. Vern.  $\left\{ \begin{array}{l} \textit{ghānto} \\ \textit{mokha.} \end{array} \right.$

F. B. I. III. 604. Br. 305.

Fl. and young foliage May-June.



- (193) *JASMINUM ARBORESCENS*. Vern. *chambeli*.  
F. B. I. III. 594. Br. 311.  
A climber or erect shrub. Common.
- (194) *J. PUBESCENS*.  
F. B. I. III. 592.  
Cultivated in gardens.
- (195) *J. GRANDIFLORUM*.  
F. B. I. III. 603.  
Cultivated.
- (196) *NYCTANTHES ARBOR-TRISTIS*. Vern. { *sihāru.*  
  *khirsāri* (Gondi).  
F. B. I. III. 603., Br. 314.  
Young foliage June.  
Common on laterite and coppices vigorously.

## APOCYNACEÆ.

- (197) *CARISA CARANDAS*. Vern. *rai kuronda*.  
F. B. I. III. 630. Br. 320.  
Cultivated near villages. The flowers are sweet-scented and come out in March. Believed to be a cultivated form of the next species.
- (198) *C. SPINARUM*. Vern. *karonda*.  
F. B. I. III.; 631. Br. 321.  
Exceedingly common, especially in the trap country and on black soil; the fresh green of the young leaves and the white star-like, strong-scented flowers which appear in the beginning of the hot season, in March-April, affording at this season a pleasant contrast to the black rocks, dark soil, and dried up red and yellow grasses which then characterize the trap region. Fruit ripens cold season; has a delicious flavour and makes excellent tarts and jelly.
- (199) *TABERNÆMONTANA CORONARIA*.  
F. B. I. III. 646. Br. 322.  
Common in gardens.
- (200) *PLUMERIA ACUTIFOLIA*. Vern. *champa*.  
F. B. I. III. 641. Br. 323.  
Common in gardens.
- (201) *WRIGHTIA TINCTORIA*. Vern. { *dudhi.*  
  *bajardantu*.  
F. B. I. III. 653. Br. 324.  
Fl. and young foliage April. The follicles remain on the trees through cold season and ripen and dehisce on the trees in April. Old leaves shed January-February. The flowers and follicles of the local species agree with those of *W. tinctoria*, but the leaves are soft tomentose and resemble those of *W. tomentosa*.

- (202) *HOLARRHENA ANTIDYSENTERICA*, Vern. *dudhi*.  
 F. B. I. III. 644. Br. 326.  
 Sweet-scented white flowers in May. Young foliage April-May. Fruit remains on trees through cold season.
- (203) *TEHNOCARPUS FRUTESCENS*, Vern.  $\left\{ \begin{array}{l} \textit{dimarbol.} \\ \textit{kauwārori.} \end{array} \right.$   
 F. B. I. III. 669. Br. 327.  
 Fl. cold season; fruit February.
- (204) *NERIUM ODORUM*, Vern. *kaner*.  
 F. B. I. III. 655. Br. 328.  
 Cultivated; with pink and white flowers.
- (205) *THEVETIA NERIIFOLIA*, Vern. *kaner*.  
 Commonly cultivated.
- (206) *ALLAMANDA CATHARTICA*.  
 Common in gardens.
- (207) *VINCA ROSEA*, var. *albiflora*.  
 Common in gardens.

## ASCLEPIADEAE.

- (208) *CRYPTOLEPIS BUCHANANI*, Vern.  $\left\{ \begin{array}{l} \textit{dudhi.} \\ \textit{kauwārori.} \\ \textit{badisur?} \end{array} \right.$   
 F. B. I. IV. 5. Br. 330.  
 Fruit cold season.
- (209) *CALOTROPIS GIGANTEA*, Vern.  $\left\{ \begin{array}{l} \textit{akauā.} \\ \textit{akauwā.} \end{array} \right.$   
 F. B. I. IV. 17. Br. 331.  
 Fresh flowers have a faint peculiar odour. Flowers purplish and occasionally white. Root of white variety used as a remedy for snake bite.
- (210) *C. PROCERA*, Vern.  $\left\{ \begin{array}{l} \textit{akauā.} \\ \textit{akauwā.} \end{array} \right.$   
 F. B. I. IV. 18. Br. 331.
- (211) *MARSDENIA TENACISSIMA*.—  
 F. B. I. IV. 35. Br. 333.  
 Fl. rains.
- (212) *DAEMIA EXTENSA*, Vern. *dudhi*.  
 F. B. I. IV. 20.  
 Fl. December, fruit February. In hedges near villages.
- (213) *HEMIDESMUS INDICUS*.—  
 F. B. I. IV. 5.  
 Fl. September. Fruit cold season.

## LOGANIACEÆ.

- (214) *STRYCHNOS POTATORUM*, Vern. *khaia*.  
 F. B. I. IV. 90. Br. 317.  
 In *sal* forests; not common.

(215) *BUDDLEI ASIATICA*. Vern. *chachera*?

F. B. I. IV. 83. Br. 318.

On banks of nalas and rivers. Fl. January-February.

## BORAGINÆ.

(216) *CORDIA MYXA*. Vern. *rasalla*.

F. B. I. IV. 136. Br. 336.

Not wild; planted in avenues and near villages. Fruit ripens June.

(217) *C. MACLEODII*. Vern. *dahgan*.

F. B. I. IV. 139. Br. 337.

Fl. March-April. Fruit ripens May-June. Coppices vigorously. I measured shoots 10 ft. in height on the 13th June 1901 from stools cut on the 3rd March 1901.

(218) *EHRETIA LAEVIS*.—

F. B. I. IV. 141. Br. 340.

Old leaves shed January-February. Fl. January-February. Young foliage April. Fruit ripens April-May.

(219) *E. LAEVIS* VAR *FLORIBUNDA*.—

F. B. I. IV. 141. Br. 340.

Fl. February-March.

(220) *RHABDIA LYCIOIDES*.—

F. B. I. IV. 145. Br. 341.

Common in river beds. Fl. February.

(221) *CYNOGLOSSUM LANCEOLATUM*.—

F. B. I. IV. 156.

Small hedgerow shrub.

(222) *TRICHODESMA ZEYLANICUM*.—

F. B. I. IV. 154.

Coarse, tall herb.

## CONVOLVULACEÆ.

(223) *LETTSOMIA SETOSA*.—

F. B. I. IV. 194. Br. 344.

Fl. November-December.

(224) *ARGYREIA SPECIOSA*.—

F. B. I. IV. 185. Br. 343.

Common in gardens.

(225) *PORANA PANICULATA*. Vern. *senga*.

F. B. I. IV. 222. Br. 342.

Fl. November-December.

(226) *CUSCUTA REFLEXA*. Vern. *amarbel*.

F. B. I. IV. 225.

Fl. December-January.

(227) *IPOMAEA TURPETHUM*.—

F. B. I. IV. 212.

- (228) I. QUAMOCLIT.—  
F. B. I. IV. 199.  
Cultivated in gardens and near villages. Very handsome  
with its red flowers and dark-green narrow linear  
leaflets.
- (229) I. HEDERACEA.—  
F. B. I. IV. 199.  
Commonly cultivated in villages.
- (230) I. COCCINEA.—  
F. B. I. IV. 199.  
Commonly cultivated in villages; with showy dark-red  
flowers.
- (231) I. SEPIARIA.—  
F. B. I. IV. 209.  
In hedges; white flowers, December.
- (232) I. BONA-NOX. The Moon Flower.  
F. B. I. IV. 197.  
In gardens.
- (233) RIVEA HYPOCRATERIFORMIS.  
F. B. I. IV. 184.
- (234) CONVULVULUS ARVENSIS.—  
F. B. I. IV. 219.  
Common in fields.

## SOLANACEÆ.

- (235) DATURA FASTUOSA. Vern. *datūra*.  
F. B. I. IV. 242.  
Fl. red; waste places near villages.
- (236) D. STRAMONIUM. Vern. *datūra*.  
F. B. I. IV. 242.  
Fl. white. Waste places near villages.
- (237) SOLANUM XANTHOCARPUM. Vern. *budkoia*.  
F. B. I. IV. 236.  
Common straggling weed.
- (238) S. MELONGENA. Vern.  $\begin{cases} \textit{banbhata.} \\ \textit{barkatiya.} \end{cases}$   
F. B. I. IV. 235.  
In waste places near villages, probably as an escape.  
Fruit globose yellow.
- (239) WITHANIA SOMNIFERA.  
F. B. I. IV. 239.  
Small hedgerow shrub.  
Fl. March.

## SCROPHULARINÆ.

- (240) CELSIA COROMANDELIANA.  
F. B. I. IV. 251.  
Stout, herbaceous plant of hedgerows. Yellow flowers  
February.

## BIGNONIACEÆ.

- (241) *MILLINGTONIA HORTENSIS*.  
 F. B. I. IV. 377. Br. 347.  
 Common in gardens and avenues. Fl. end of rains.  
 Does not here form fruit; young foliage April-May.
- (242) *STEREOSPERMUM XYLOCARPUM*. Vern.  $\left\{ \begin{array}{l} \text{pāral.} \\ \text{bhainspāral.} \end{array} \right.$   
 F. B. I. IV. 383. Br. 349.  
 Common in trap area.  
 Fl. April-May.
- (243) *STEREOSPERMUM SUAVEOLENS* Vern.  $\left\{ \begin{array}{l} \text{pāral.} \\ \text{pāndri.} \\ \text{jaimangal.} \end{array} \right.$   
 F. B. I. IV. 382. Br. 351.  
 Fl. April-May; young foliage appears at same time.  
 Fruit remains on tree through cold season and ripens April.  
 Common in *sal* forest, but also found in teak area on trap.
- (244) *DOLICHANDRONE FALCATA*. Vern.  $\left\{ \begin{array}{l} \text{dudga.} \\ \text{mersing.} \end{array} \right.$   
 F. B. I. IV. 380. Br. 350.  
 Flowers April-May; young foliage at same time.  
 Fruit cold season.
- (245) *OROXYLUM INDICUM*. Vern.  $\left\{ \begin{array}{l} \text{sumpāral.} \\ \text{sona.} \end{array} \right.$   
 F. B. I. IV. 378. Br. 347.  
 Planted near villages, in north of area, by Basores, who use the seeds for making hats and umbrellas. Fruit ripens January-March.
- (246) *BIGNONIA VENUSTA*.  
 Common in gardens.  
 Fl. March-April.
- (247) *TECOMA STANS*.  
 Common in gardens.

## PEDALINEÆ.

- (248) *SESAMUM INDICUM*. Vern. *tīl*.  
 F. B. I. IV. 386.  
 Commonly cultivated.

## ACANTHACEÆ.

- (249) *ADHATODA VASICA*. Vern. *rusa*.  
 F. B. I. IV. 540.  
 Gregarious in waste places near villages, especially in shady localities.
- (250) *STROBILANTHES AURICULATUS*.  
 F. B. I. IV. 453.  
 Fl. cold season.

- (251) *DAEDALACANTHUS PURPURASCENS*.  
F. B. I. IV. 420.  
Undershrub of shady places.  
Fl. cold season.
- (252) *PETALIDIUM BARLERIODES*. Vern.  $\begin{cases} \text{bunbuni?} \\ \text{katsuriya?} \end{cases}$   
F. B. I. IV. 416.  
Fl. January-February and hot season. Common in sandy places, often with *Vitex Negundo*. Bark exfoliating in long papery strips.
- (253) *BLEPHARIS BOERHAAVIAEFOLIA*.  
F. B. I. IV. 478.  
Fl. February; small undershrub with weak scrambling stems.
- (254) *HYGROPHILA SPINOSA*. Vern. *unt kalāra*.  
F. B. I. IV. 408.  
Small, spinescent, undershrub, gregarious in damp ditches, near tanks and such places. Has handsome blue flowers and is greedily eaten by camels.
- (255) *BARLERIA CRISTATA*.  
F. B. I. IV. 488.  
Small undershrub of shady forests.
- (256) *B. PRIONITIS*.  
F. B. I. IV. 482.  
In shady places near villages.
- (257) *B. LUPULINA*.  
F. B. I. IV. 482.  
In gardens.

## VERBENACEÆ.

- (258) *TECTONA GRANDIS*. Vern.  $\begin{cases} \text{sāgon.} \\ \text{teka (Gondi).} \end{cases}$   
The teak tree.  
F. B. I. IV. 570. Br. 354.  
Young leaves appear end of May in damp places, but full foliage not developed until June-July.  
Stools cut on the 3rd March 1901 had sent out coppice shoots 2 ft. in height by 13th June 1901, although the teak trees in the surrounding forests were still quite bare of leaves. Coppice shoots three years old and 18 ft. high have been measured locally.
- (259) *CLEODENDRON PHLOMIOIDES*. Vern. *khirni*.  
F. B. I. IV. 590.  
Small tree, occasionally met with near villages.
- (260) *C. INFORTUNATUM*.  
F. B. I. IV. 594. Br. 363.  
Gregarious in shady places.  
Fl. March.

- (261) *C. SERRATUM*—  
F. B. I. IV. 592. Br. 364.
- (262) *C. SIPHONANTHUS*.  
F. B. I. IV. 595. Br. 364.  
Fairly common in hedges, in black cotton soil.
- (263) *HOLMSKIOEDEA SANGUINEA*—  
F. B. I. IV. 596.  
Only found once; undoubtedly wild; cultivated near villages.
- (264) *GMELINA ARBOREA*. Vern.  $\begin{cases} \textit{khuner.} \\ \textit{khursi.} \end{cases}$   
F. B. I. IV. 581, IV. Br. 364.  
Young foliage April-May.  
Fl. March-April.  
Fruit ripens May-June, and is eaten by Gonds.
- (265) *VITEX NEGUNDO*. Vern.  $\begin{cases} \textit{ningōri.} \\ \textit{nengur.} \end{cases}$   
F. B. I. IV. 583. Br. 369.  
Young foliage March-April.
- (266) *PREMNA LATIFOLIA* Var. *MUCHONATA*. Vern. *Kota khursi*.  
F. B. I. IV. 578. Br. 366.  
Fl. July. Fruit October-November. Leaves have a strong unpleasant smell and fresh-felled wood exudes a green-coloured sap. Common on trap.
- (267) *P. BARBATA*. Vern.  $\begin{cases} \textit{karandi.} \\ \textit{kota khursi.} \end{cases}$   
F. B. I. IV. 579. Br. 367.  
Large shrub or small tree.  
Fairly common in trap area.
- (268) *DURANTA PLUMIERI*. } Common  
F. B. I. IV. 560. } in
- (269) *PETRAEA STAPELIA*. } gardens.
- (270) *LANTANA CAMARA*.  
F. B. I. IV. 562.  
Cultivated and run wild.
- (271) *STACHYTARPHETA INDICA*—  
F. B. I. IV. 564.  
Small shrub in gardens.

## LABIATAE.

- ( 72) *POGOSTEMON PLECTRANTHOIDES*. Vern.  $\begin{cases} \textit{kora.} \\ \textit{banlengor.} \end{cases}$   
F. B. I. IV. 632.  
Fl. January-February. A gregarious shrub of shady places with a strong smell like that of black currants.
- (273) *LAVANDULA BURMANNI*—  
F. B. I. IV. 631.  
Small undershrub of dry forests. Common on trap.

(274) *ANISOMELES OVATA*.

F. B. I. IV. 672—

Tall branching herbaceous plant, the tall stems with dry fruit heads and the old leaves, which have then become red, being a noticeable feature of the hedgerows in the cold season.

(275) *LEONOTIS NEPETÆFOLIA*—

F. B. I. IV. 691.

Coarse, herbaceous plant of waste places near villages. Attaining a height of 6 ft. and very noticeable with its globose heads of red flowers.

(276) *SALVIA PLEBEIA*—

F. B. I. IV. 655.

Small shrub of hedgerows.

(277) *S. SPLENDENS*.

Small shrub, common in gardens.

## AMARANTACEÆ.

(278) *ÆRUA LANATA*.

F. B. I. IV. 728.

(279) *AMARANTUS SPINOSUS*.—

F. B. I. IV. 718.

Herbaceous plant of waste places, with hollow hard stems.

(280) *ACHYRANTHES ASPERA*—

F. B. I. IV. 730.

Tall coarse herbaceous plant, common weed.

## NYCTAGINEÆ.

(281) *BONGAINVILLEA GLABRA*—

Common in gardens.

## CHENOPODIACEÆ.

(282) *BASELLA RUBRA*.

F. B. I. V. 20.

Succulent, strong-smelling twiner.

## PIPERACEÆ.

(283) *PIPER BETLE*. Vern. *pān*.

F. B. I. V. 85.

Commonly cultivated.

## LAURINEÆ.

(284) *LITSOEA SEBIFERA*. Vern. *māida*.F. B. I. V. 158. Br. 379. (*Tetranthera laurifolia*.)

Not common.

(285) *L. SEBIFERA*. Var. *glabraria*.

F. B. I. V. 159.

## PROTEACEÆ.

(286) *GREVILLEA ROBUSTA*.

Cultivated.



## LORANTHACEÆ.

- (287) *Viscum articulatum*. Vern. *bānda*.  
F. B. I. V. 226. Br. 393.
- (288) *Loranthus longiflorus*. Vern. *bānda*.  
F. B. I. V. 214. Br. 397.  
Fl. cold season.

## EUPHORBIACEÆ.

- (289) *Euphorbia nivulia*. Vern. *thuhar*.  
F. B. I. V. 255. Br. 439.  
Branches without ribs. Wild in dry rocky places,  
common on Vindhyan sandstone.
- (290) *E. nerifolia*. Vern. *thuhar*.  
F. B. I. V. 255. Br. 439.  
Branches ribbed. Planted in fences.
- (291) *E. tirucalli*. Vern. *thuhar*.  
F. B. I. V. 254. Br. 439.  
Run wild near villages.
- (292) *E. pulcherrima*. (*Poinsettia*)—  
Br. 439.  
Common in gardens.
- (293) *E. heterophylla*.  
Common in gardens.
- (294) *Jatropha curcas*. Vern.  $\left\{ \begin{array}{l} \text{chandarjot.} \\ \text{baranda.} \end{array} \right.$   
F. B. I. V. 383., Br. 442.  
Common in village fences.
- (295) *Mallotus philippinensis*. Vern. *rora*.  
F. B. I. V. 442. Br. 444.  
In damp places, near nalas and streams.
- (296) *Homonoia riparia*. Vern. *surra*.  
F. B. I. V. 455. Br. 445.  
In rocky river beds.
- (297) *Ricinus communis*. Vern. *arand*.  
F. B. I. V. 457. Br. 445.  
Commonly cultivated.
- (298) *Antidesma diandrum*. Vern.  $\left\{ \begin{array}{l} \text{khatua.} \\ \text{amta (Gondi).} \end{array} \right.$   
F. B. I. V. 361. Br. 447.
- (299) *Bridelia retusa*. Vern. *kasai*.  
F. B. I. V. 268. Br. 449.
- (300) *Glochidion velutinum*.—  
F. B. I. V. 322. Br. 452 (*Phyllanthus nepulensis*).  
Small tree; fl. April.
- (301) *Phyllanthus reticulatus*. Vern. *mukhru*.  
F. B. I. V. 288. Br. 453.  
Large shrub, in hedges in open country. Fl.  
February-March. Twigs used as tooth-brushes.

- (302) *P. EMBLICA*. Vern.  $\left\{ \begin{array}{l} \text{aunla,} \\ \text{aunra,} \\ \text{nalli} \\ \text{lalli.} \end{array} \right\}$  (Gondi).  
F. B. I. V. 289., Br. 454.  
Fl. and young foliage April.
- (303) *FLUEGGEA MICROCARPA*. Vern.  $\left\{ \begin{array}{l} \text{sirkin.} \\ \text{chirechar.} \\ \text{chiregori.} \end{array} \right\}$   
F. B. I. V. 328. Br. 455 (*Securinea obovata*).
- (304) *BALIOSPERMUM AXILLARE*. Vern. *hansia dafar*.  
F. B. I. V. 461.  
Small shrub of waste places; stems a remedy for toothache.
- (305) *PEDILANTHUS TITHYMALOIDES*. Vern.  $\left\{ \begin{array}{l} \text{nāgphani.} \\ \text{nāgāman.} \end{array} \right\}$   
F. B. I. V. 239.  
Succulent shrub, planted in hedges.
- (306) *CHROZOPHORA PLICATA*.  
F. B. I. V. 409.
- (307) *ACALYPHA MARGINATA*.  
Common in gardens.
- URTICACEÆ.
- (308) *MORUS LAEVIGATA*. Vern. *tūt*.  
F. B. I. V. 492 Br. 409.  
Commonly cultivated for its fruit.
- (309) *FICUS BENGALENSIS*. Vern. *bar*.  
F. B. I. V. 499 Br. 412.  
Young foliage April.
- (310) *F. TOMENTOSA*. Vern. *chitākar*.  
F. B. I. V. 501. Br. 414.
- (311) *F. INFECTORIA*. Vern. *pākar*.  
F. B. I. V. 515. Br. 414.  
Receptacles are shortly peduncled.
- (312) *F. RELIGIOSA*. Vern.  $\left\{ \begin{array}{l} \text{pipal.} \\ \text{āli (Gondi).} \end{array} \right\}$   
F. B. I. V. 513. Br. 415.  
Young foliage April. Fruit cold season and again February-March.
- (313) *F. PALMATA*.  
F. B. I. V. 530 Br. 419 (*Ficus virgata*).
- (314) *F. CARICA*. Vern. *anjīr*.  
Br. 418.  
Cultivated in gardens.
- (315) *F. GLOMERATA*. Vern.  $\left\{ \begin{array}{l} \text{ūmar.} \\ \text{gūlar.} \\ \text{toiya (Gondi).} \end{array} \right\}$   
F. B. I. V. 535., Br. 422.

Common near streams.

Young foliage April.

- (316) *F. HISPIDA*, Vern. *kal-ūmar*.

F. B. I. V. 522. Br. 423.

Usually a shrub, rarely a small tree.

- (317) *F. GIBBOSA*, Vern. *majni*.

F. B. I. V. 496. Br. 420. (*Ficus parasitica*.)

- (318) *F. SCANDENS*, Vern. *pākar*.

F. B. I. V. 526. Br. 421.

In general appearance very like a small *F. infectoria*, and the vernacular name is consequently the same for both species.

- (319) *ARTOCARPUS INTEGRIFOLIA*, Vern. *kathār*.

F. B. I. V. 541. Br. 425.

Cultivated.

- (320) *A. LAKOOCHA*, Vern. *barhār*.

F. B. I. V. 543. Br. 426

Cultivated.

- (321) *TREMA POLITORIA*, Vern.  $\left\{ \begin{array}{l} \text{andia.} \\ \text{majni.} \\ \text{jilmili?} \end{array} \right.$

F. B. I. V. 484. Br. 430 (*Sponia politoria*).

Fl. July. Fruit cold season. Comes up rapidly on freshly broken ground, in the forest, e.g. on road embankments, sides of cuttings, etc.

- (322) *T. ORIENTALIS*, Vern.  $\left\{ \begin{array}{l} \text{andia.} \\ \text{kūrsa.} \end{array} \right.$

F. B. I. V. 484. Br. 430 (*Sponia orientalis*).

Not common.

- (323) *HOLOPTELA INTEGRIFOLIA*, Vern. *chirhōl*.

F. B. I. V. 481. Br. 431. (*Ulmus integrifolia*.)

Fl. February. Fruit March-April.

- (324) *CELTIS TETRANDBRA*.—

F. B. I. 482. Br. 429.

Fairly common on the banks of streams in the trap country. Flowers and young foliage appear February-March, at which season the beautiful rich green of the young leaves makes this species very noticeable.

- (325) *STREBLUS ASPER*, Vern. *majni*.

F. B. I. V. 489. Br. 410.

- (326) *CANNABIS SATIVA*, Vern. *bhang*.

The hemp.

F. B. I. V. 487.

Cultivated.

#### CASUARINÆ.

- (327) *CASUARINA EQUISETIFOLIA*, Vern. *surra*.

F. B. I. V. 598. Br. 435.

Cultivated in gardens.

Fl. February-March.

## SALICINÆ.

- (328) *SALIX TETRASPERMA*. Vern. *bainsa*.  
F. B. I. V. 626. Br. 462.  
Locally gregarious along rivers.

## CONIFERÆ.

- (329) *THUJA ORIENTALIS*.  
F. B. I. V. 644 Br. 534.  
In gardens.

## SCITAMINÆ.

- (330) *CURCUMA LONGA*. Vern. *haldi*.  
F. B. I. VI. 214.  
Cultivated.

- (331) *MUSA SAPIENTUM*. Vern. *kela*.  
F. B. I. VI. 262.  
Cultivated.

## AMARYLLIDÆ.

- (332) *AGAVE AMERICANA*.  
F. B. I. VI. 277.  
Cultivated in fences.

## DIOSCOREACEÆ.

- (333) *DIOSCOREA SATIVA*. Vern. *agita*.  
F. B. I. VI. 295.  
Fl. rains, and in foliage only at this season; dry fruit  
remaining on plant during cold season.
- (334) *D. PENTAPHYLLA*. Vern. *baichandi*.  
F. B. I. VI. 289.  
In leaf and flower during rains.

## LILIACEÆ.

- (335) *GLORIOSA SUPERBA*.  
F. B. I. VI. 358.  
Fairly common. The beautiful red and golden flowers  
in rains.
- (336) *ASPARAGUS RACEMOSUS*. Vern. *sataor*.  
F. B. I. VI. 316.
- (337) *SMILAX MACROPHYLLA*. Vern. *rāmdatūn*.  
F. B. I. VI. 310.  
Common; stems are used as tooth-brushes.

## PALMÆ.

- (338) *BORASSUS FLABELLIFER*. Vern. *tār*.  
F. B. I. VI. 482. Br. 544.  
Occasionally cultivated.
- (339) *ARECA GATECHU*. Vern. *supāri*.  
F. B. I. VI. 405. Br. 551.  
Occasionally cultivated.
- (340) *CARYOTA URENS*.  
F. B. I. VI. 422.  
Occasionally cultivated.

- (341) PHENIX SYLVESTRIS. Vern. *khajūri*.

F. B. I. VI 425 Br. 554

Widely cultivated and in places run wild.

- (342) P ACAULIS Vern. *chind*.

F. B. I. VI 426. Br. 555.

Fl. April. The tender white peduncle is pulled out of the ground and eaten. It has a sweet taste. The tufts of handsome, broad, linear, lanceolate entire leaves often borne by this plant are very characteristic. There are two forms locally recognised, viz., (1) *kuchu chind* with a large bulbous rootstock used as a brush for polishing metal ornaments, and (2) *bara chind* with no bulbous rootstock. The leaves of (1) are more rigid than of (2). As yet I have not been able to get complete specimens of both forms, but hope to do so.

#### PANDANÆ.

- (343) PANDANUS FASCICULARIS. Vern. *keora*.

F. B. I. VI. 485.

Fl. rains.

#### GRAMINEÆ.

- (344) BAMBUSA ARUNDINACEA. Vern. *kullang bāns*.

F. B. I. VII. 395. Br. 564.

Cultivated; not wild in this area.

- (345) DENDROCALAMUS STRICTUS. Vern.  $\left. \begin{array}{l} \text{bāns.} \\ \text{ukadur.} \\ \text{wuddur.} \end{array} \right\}$  Gondi.

F. B. I. VII. 404. Br. 569.

Young leaves April-May.

- (346) SACCHARUM OFFICINARUM Vern. *ganna*.

F. B. I. VII. 118.

Cultivated.

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## II—CORRESPONDENCE.

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### Forest Defence Fund.

Will any subscribers to this Fund who object to the balance of money now in the hands of the Assistant Inspector-General being made over to the Forest Association (which now includes a hundred members of the Imperial Service) kindly notify their objection to the Assistant Inspector-General before the 1st March, 1905, after which date it is proposed to transfer the money in question to the Forest Association?

### An Experiment in Felling and Logging.

On looking up an old diary of two years ago I find the details of an experiment in tree felling which I made whilst on the hill section of the Assam-Bengal Railway. The experiment was made for my own purposes, but I think the results may prove of interest to some Forest Officers, and I therefore send you details of the experiment.

In connection with my work on the Railway I was doing a large amount of timber felling and conversion for bridge timbers, sleepers, and woodwork for the construction of stations, quarters, etc. Amongst a very large and mixed labour force working on the Railway I had Nepalese, Punjabi and Bengali (Sylheti) sawyers. These latter men could not be induced to enter the jungle and convert the trees on the spot, but would only work when the logs were drawn out into depots near the line. The experiment of which I write was the felling and dividing into logs of the tree known as nagesar (*Mesua ferrea*), one of the hardest woods known. I had no difficulty in selecting a number of trees growing within a comparatively small space and averaging about 45 feet in the bole, though some were a good deal longer. The men to be employed on the work were divided into pairs, as follows:—

1st pair, Punjabi Sikhs of the Tarkhan class.

2nd pair, Punjabis, one Sikh and one Mussalman, both of the Tarkhan class.

3rd pair, Kukis (one of the jungle Hill tribes of Assam).

The trees were selected and measured carefully by myself, and the time taken from the first stroke of the axe until the bole of the tree touched the ground. The date was the 9th October 1902.

Men employed.	Implements used.	Girth of tree at 5' from ground.	Time taken to fell tree.	Number of logs converted.	Time taken to log.
1st pair (Punjabi Sikhs).	Axe and saw.	6' 6"	A.M. A.M. 9-5 to 10	3 in 3 cuts.	A.M. P.M. 10 to 12
2nd pair (Punjabi Sikh and Mussalman).	Do. ...	5' 10"	9 10 to 9-50	4 in 4 cuts.	9-50 to 12-30
3rd pair (Kukis).	Cutting axes only.	6'	9-5 to 10	2 in 2 cuts.	10 to 12-30

A second tree was felled by each pair between 1 and 3 p. m., one log only being cut by each pair from the thick end of the tree within this period. The first pair were given a tree of 7' 10" girth, the other two pairs one of 6' girth apiece.

The first pair of men used axes of Punjabi pattern, and also made considerable use of the Punjabi hand saw in both felling and cross-cutting, but most of the latter was done with an M-toothed double-handed cross-cut saw.

The second pair used American felling axes, and did not make much use of the saw in felling. They also used an M-toothed saw in cross-cutting.

The third pair used their own axes (very narrow in the blade and light) for felling and also for logging the tree, as they were unable to use the saw, never having worked with it.

The men were of course worked under pressure, as I had offered a substantial prize to the best pair. This prize was awarded to the second pair.

JOGRAON, PUNJAB.  
2nd October 1904.

M. H. LOGAN,  
*Resident Engineer,*  
*Southern Punjab Railway Extension.*

### **Service in Madras.**

Service in the Forest Department in Madras is not popular, and the reasons for this are numerous. Some of the causes are inherent and cannot be remedied, others might and some day may be remedied, but there is one outstanding cause of unpopularity at the present time which can be and ought to be remedied without further delay.

Leave is being refused and has been refused very generally for the last eighteen months on account of scarcity of officers. This scarcity is not due to the absence on leave of a large proportion of officers, because the Departmental list for the 30th September shows that out of a cadre of 36 there are only three Imperial Service officers on furlough and one on privilege leave, while there is only one Provincial Service man absent on leave out of a sanctioned scale of eighteen. The true reason is not far to seek. Out of eleven Assistant Conservators only four exist. Two are held by pilots, two have been transferred to the Provincial Service, and three are vacant. The state of affairs is even worse with the lower controlling staff. The only Extra Deputy Conservator is on foreign service. Two Extra Assistants out of eighteen are on foreign service, one holds an appointment in the office of the Board of Revenue, and five are vacant!! No wonder that the Department is short-handed and that officers are refused leave without the concomitant advantage of gaining officiating promotion. No one of course grudges officers of the lower controlling staff being seconded for foreign service where they draw more pay than officers on the Imperial list and of about the same standing, but both goose and gander should have some of the sauce, and it is certainly disheartening

to be unable to get leave partly because sanctioned appointments are not filled up and partly because officers are seconded for foreign service and for other duties for apparently indefinite periods, with the result that the Department in Madras is seriously undermanned.

PUNGAM.

### III.—OFFICIAL PAPERS & INTELLIGENCE.

#### The Distribution of Seed.

*The following extract, paragraphs 65—67, from the report of the Director, Department of Land Records and Agriculture, United Provinces of Agra and Oudh, for the year 1901-02, is of considerable interest:—*

The work of the department falls into two divisions: cash sale of seeds at Cawnpore, the issues including such foreign staples as are asked for, as well as the best local varieties; and issue of seeds on loan to cultivators from various depots. From Cawnpore 89 kinds of seed were issued, about 336 maunds in all being disposed of. The varieties most in demand were Muzaffarnagar wheat, Cape oats, and Jaunpur maize. The demand for Canadian oats, acclimatised cotton, *inga dulcis*, peas and rape was in excess of the available supply.

Seed depôts were at work during the year in Partabgarh, Aligarh, Meerut, Mohanlalganj, Beti, Sultanpur and Amethi. The first three are managed and financed directly by the Department: those at Mohanlalganj and Beti are managed by the Court of Wards with departmental assistance: those at Sultanpur and Amethi are managed by the department but financed by the district board. In addition to these centres, operations have started in Fyzabad, where the Deputy Commissioner has devoted some funds at credit of the agricultural show to the same purpose.

The scheme of operations at those various centres is uniform: clean, sound seed is issued to cultivators, who return the produce at harvest time *plus 25 per cent.* The receipts are carefully cleaned and picked, all inferior seed being sold and the balance kept for issue in the next year. When operations started in Partabgarh I tried to work through the landholders, but their interest in the matter was short lived, and direct dealing with the cultivators is proving far more satisfactory. The work done during the year may be summarised as follows. The issues from the depots controlled by the Department were 756 maunds, of which 534 maunds were Muzaffarnagar wheat. The Mohanlalganj depot issued 217 maunds, consisting of wheat and oats, and that at Beti 621 maunds, mostly wheat. The depots at Sultanpur and Amethi issued 444 maunds of wheat and a small quantity of maize. The total issues thus amounted to over two thousand



maunds. There was practically no loss in recovery, and issues for the current rabi are on a considerably increased scale, while arrangements are being made to procure stocks of kharif seeds for which a demand has arisen. The work is carried on at small profit, which is devoted to extending operations: it does not at present admit of reducing the rate of interest. The keenest desire for seed continues to be manifested in the neighbourhood of Amethi, where the cultivators crowded to the railway station to await the arrival of the imported seed; but in other localities also the services of the Department are cordially welcomed.

#### IV.—REVIEWS.

##### **Forest Administration in Mysore.**

In our Review\* of the Government of India's Annual Report on Forest Administration for 1901-02, the Reviewer ventured to point out that the Government of India were not apparently quite at rest on the score of the Forest Conservancy in Mysore and that some questions addressed to the Officiating Conservator had remained unanswered. From editorial reviews in the August issues of our enlightened contemporary the *Madras Mail* it would appear that the Report for 1902-03 shows that the results of that year's working are even less satisfactory.

Space will not allow of our examining very minutely the articles in question; but whilst glancing at the points of greatest interest we deem it a duty to draw attention to an aspect of the position, touched upon it is true by the writer but whose seriousness we cannot but think requires more careful consideration. In a leader of the issue of the 1st August under the heading "Forest Administration in Mysore" the *Mail* reviews the Forest Administration of that Province during 1902-03. The excellence of the public administration and the excellent example of enterprise set by the Mysore State has become a by-word in India. The Cauvery Falls Power Scheme will suffice as an instance of this enterprise and of the enlightened and far-seeing lines upon which the Government is managed. Other instances could be quoted and, as our contemporary states, there is little but praise to be bestowed until the subject of the forest conservancy of the State is approached. In this the position of affairs is far from being as satisfactory as could be wished. Commenting upon the work accomplished we read as follows:—

"The Report for 1903 is rather a wail about things undone than a record of progress. No new State forests were notified; considerable progress is reported to have been made in selections of some 135 square miles, but the bulk had to be sent back,

\* Vide 'Indian Forester,' XXX, No. 1.

because information was defective. Under Settlement, a special officer was appointed, but practically he did no work; in two other cases the work was delayed from defective information, and in two more from frequent transfers of the officers. Consequently but little was completed during the year. In Surveys, it is stated that the outturn, quality and nature of check on the work showed practically no improvement. The prescription of working plans is said to have been adhered to in two forests, but later on it is shown that in one the allotted coupes were not worked out for want of contractors, in the other only one of the two coupes was worked; in Tunkur, operations in three coupes were started only late in the year: in Simoga, the working plans remained inoperative. Annual plans of operations were made, and quarterly reports called for, so that the Conservator might assure himself that works were being carried out—with what result the above details show.

“Under cases of injury to sandal trees, the Conservator noticed so many during his inspections that he considered at least a hundred times the number of cases occurred than which were reported. The blame is laid on the lower subordinates, but it seems to us to lie with the controlling and upper executive establishments.

“The total area of Reserved Forest is 1,950 square miles, of Reserved lands 705 square miles, making a percentage of 9·2 of the whole area of the State. Switzerland, with 19 per cent of its area under forest, considers that too small, and has been making stringent regulations prohibiting the breaking up of wooded land unless an equal or greater area is simultaneously planted up. The Mysore territory is on a plateau some 3,000 ft. above sea level, with many large and important rivers—Cauvery, Ponnar, Palar, Pennar and Tungabhadra, all with large affluents—rising in it. Surely something is required for the protection of the head waters of these rivers, for, although mountains rise higher in Switzerland than in Mysore, the tropical sun in Mysore more than compensates for any difference in elevation. On the other hand, the requirements of forest produce in India are far greater than in Europe, where metal takes the place of wood for building, agricultural implements, etc., and coal takes the place of firewood, and so on. It seems to be of fundamental importance, not only that Protective Forests should be selected, but that an investigation should be made to find out the *real* annual demand for forest produce by *all* classes of the population.

“Under the head of Natural Reproduction, the *Diospyrus ebenum*, referred to in the Report under review, is probably *Diospyrus tupa* (from the Canarese name *tupa*) which is an open-forest-loving species, whilst the former belongs to the evergreen forest. The bad reproduction of *Hardwickia* is probably due to cattle, which eat up every seedling and coppice shoot that they can get hold of. No mention is made of

attempts at assisting this valuable species by closing the forests to grazing, fencing and dibbling in. Sandal is mentioned as having suffered from the contagious and infectious 'spike-disease,' but nothing is said as to how many trees have had to be extracted, nor whether the disease is on the increase or otherwise. It is stated that reproduction is excellent, every thorny bush containing a sapling; but if goats eat down the thorny bushes, and 'herdsmen lop the branches and otherwise mutilate it with impunity,' the prospects of sandal in Mysore are not very promising, and the mere suggestion that the practice referred to 'deserves to be put down with a high hand' appears inadequate. Under planting, 'vast areas' are reported to have been operated on; but, as far as can be computed from the figures, only about a fifth of a square mile of teak and nine square miles of sandal (seed dibbled in), say, about  $\frac{1}{300}$ th part of the Forest estate, was so worked at. The results so far as shown, if 30 to 50 per cent are thriving, appear to be fairly satisfactory. There was an increase in the departmental fellings, collection to depôt, and sales of timber, likewise in timber removed by purchasers, in bamboos and in sandal, but a falling off in firewood and minor produce, both departmentally and by purchasers. The financial results showed an increase in the surplus over the previous year of about half a lakh of rupees, the receipts were Rs. 14.77 lakhs against charges Rs. 4.80 lakhs. Surely with a surplus of nearly Rs. 10 lakhs something better might be done towards real conservancy."

In a lengthy, we cannot but think too lengthy and perhaps unfortunate, letter, for *qui s'excuse, s'accuse*, the Mysore Conservator designates the *Mail's* leader as a garbled account of the operations of the Forest Department in Mysore, complaining that the article is full of misstatements and exaggerations. It would be out of the question, and would serve no useful purpose even if it were possible, to reproduce the letter *in extenso* in these columns (we find it contains some 2,600 words interspersed with numerous tables of annual averages destined to show or prove how much better the present administration of Mysore is (1) than that in Madras, Bombay or the Indian Provinces, (2) than it was in former days, *i. e.*, ulterior to the reign of the present Conservator). In his letter the latter quotes many facts upon which, as the editorial upon it published in the same issue of the paper points out, the Report is quite silent. He also gives answers to some restrictions made upon the opening of forests to goat browsing which satisfy the *Mail*, but upon which we ourselves cannot feel quite at rest. The Conservator, we think, has not really grasped the importance of the grazing question or of that larger afforestation question, which owing to the peculiar—one might almost say unique—configuration and situation of the territory of the State is one the full realisation of which is of the first importance to its future

well-being. Upon the proper maintenance and conservation of the Forests round their head waters entirely depend several great rivers and upon the part taken now by the State in reservations of forest tracts, either as Reserves or Protected areas, will depend the future happiness and prosperity of its people.

We cannot, however, pass over in silence the following paragraph of the Conservator's letter :—

"Since your criticisms have been directed towards picking holes in the Forest administration, I do not wonder that you had nothing to say about our achievements in the direction of *development of revenue*, of the substitution of a rational system of working for unregulated exploitation in vogue in previous years, or of the efforts made to regulate the exploitation of sandal and for the husbanding of our resources by collecting dead and fallen sandal trees in place of standing ones, and of the improvements effected in communications and buildings during the year. As the best test of the success or failure of an administration is invariably furnished by the financial results, I give these below and compare them with those of some of the British Provinces :—

	Gross revenue.	Expenditure.	Surplus.	Ratio of surplus to gross revenue.
<i>Mysore.</i>	Rs.	Rs.	Rs.	
Average for 3 years ending 1898 ...	10,94,290	4,34,592	6,59,698	60.2
Average for 3 years ending 1901 ...	12,56,605	4,39,314	8,17,291	65.2
For 1902-03 ...	14,77,656	4,8,061	9,97,595	67.5
Madras, 1902-03 ...	25,92,779	18,26,555	7,66,224	29.5
Central Provinces, 1902-03 ...	14,39,933	11,21,090	3,18,843	22.1
Burma, 1902-03 ...	1,24,77,787	53,83,440	70,94,347	56.9
Bombay, 1901-02...	23,54,380	16,68,142	6,86,238	29.1

From the above comparison I do not wish it to be understood that our finances are better or more economically administered; but I think we have every reason to be proud of the fact that we have succeeded in raising the surplus in five years by over 50 per cent, especially when this result has been achieved, not by over-felling the already exhausted teak forests or by the over-exploitation of sandal, but by developing the latent resources of the forests."

The *Mail* comments upon this as follows:—

"There is only one more subject we will touch upon. The Conservator complains of our not having commended the achievements in the direction of development of revenue, of the substitution of a rational for an unregulated system of working, for efforts to regulate sandal fellings by removal of dead and fallen trees instead of standing ones, and for improvements in communications and buildings. He says that he is conscious of many shortcomings in the administration, but that every endeavour is

being made to improve matters. We had no intention of 'painting the administration blacker than it is,' as he suggests; we merely took the Report as it appeared to us in quite an unbiassed frame of mind. The regulation of sandal and other fellings is decidedly a move in the right direction, but it must be remarked that the idea in respect of sandal has been in force in Coimbatore for five years or more; and we certainly think that every road and building is an additional value to the forests, which cannot be properly looked after without them. But, as we pointed out in our original article, we cannot look upon the increasing surplus of revenue except with foreboding; for we believe that a great deal more of the surplus of nearly Rs. 10 lakhs should be utilised in conservancy and real protection, which are admittedly not yet up to the highest standard in Mysore."

We would wish here to consider this question of revenue and expenditure in Mysore. It goes without saying that every Conservator would like to be able to show a surplus of 10 lakhs on his working for the year. The head of a circle is however a man chosen for his sound knowledge of his profession and good administrative abilities. He knows what his forests require, what establishment is really necessary to look after them, what works must be undertaken if he is to carry out his real duty and leave his charge in a condition which will ensure its being not only as good as in his own time but in a state which will ensure, to the best of his ability, that it shall be in a better one for his successor and posterity. His expenditure budget with him is as important as his revenue one, for he knows that the one depends closely upon the other, and only in proportion as he expends will his successors have the power of obtaining a uniform and increasing annual revenue from the forests. Heavy overcutting at one period with big surpluses will mean the ruin of the forests and a long, a very long, period of heavy deficits and general stagnation. These are, of course, facts well known to every true forester, and we should almost apologise for alluding to them here. The question becomes, however, more complicated, and our Conservator has to proceed with greater wariness, when he possesses in his forests a species the sales from which exceed very greatly in value those from all the rest of the forest area put together. Should this species grow gregariously in certain restricted localities in a comparatively small charge our Conservator would find it very simple to work over the areas and the danger of overcutting would be reduced to small proportions, since it would be so very easy to check it. Take, however, the case of a tree whose growth is an isolated one, a tree which does not confine itself to the forest areas proper, which does not even confine itself to what we may call "village forests," or the areas under tree growth closely adjacent to villages, but which is scattered all over the area of the circle, here two or three together, there one by itself, a tree in every thorny bush, a tree to be found in forest and field alike. Such a tree as the sandal. In

such a case and with such a species does not the question of supervision become extremely difficult? Does not the power of overcutting become only too simple? Simple, not because the overcutting is necessarily intentional, but from the fact that only the highest professional training, the ripest judgment, the maturest experience, combined with the fullest knowledge of how a circle containing such a gold mine should be worked, can successfully grapple with the problem and see that the area as a whole obtains what it requires. Takes care that the forests, the real forest tracts of the country, leaving out of the question the 'gold mine' trees, are properly looked after and managed, that the needs of the population, present *and future*, are properly considered and conserved, and that the forests are maintained or brought into a high state of efficiency even if it is necessary, with this end in view, that some of the large surplus obtained from the gold mine trees is spent to effect it. To all who possess that faculty of administrative ability, partly inherent, partly trained, the tenor of the above remarks will be plain. We think that such a man placed in such a charge would at once make up his mind to separate the gold mine tree from the forest area proper and keep the revenue derived from it and the expenditure debited to it strictly apart. He would thus frame for the rest of his circle a budget which would show exactly what was the expenditure necessary for the true forests and what the revenue to be obtained from them. In this way his Local Government would be able to thoroughly realize what was the real position of the forest areas and what improvements were being effected in them with a view to increasing their value and also of keeping all tracts necessary for the well-being of the State, *i.e.*, of its agricultural lands and the headwaters of its rivers, under forest strictly conserved and restricted to cutting.

Considering the Mysore Forest Administration from this point of view we see that it is precisely on these points that the management lamentably fails, and with the figures before us we are unable to feign a surprise which we do not feel that it does so.

We have given above a table of the revenue, expenditure and surplus of Mysore for 1902-03 compared with other Provinces and Presidencies in India. This is the Conservator's *piece de résistance* upon which apparently he nails his flag, and it is on a par with the administration of the Mysore forests that this is the position taken up. We will not ask whether it is a probability that Mysore should be able to show a surplus of more than twice its expenditure when no other circle or province in India, save Burma, though they are manned by the pick of the Indian Imperial Service, can show a surplus even approaching its expenditure. We would simply here consider the following figures, and our readers can easily make their own deductions.

The figures, show that the sandal revenue and expenditure is not kept separate from the rest of the forest revenue and expenditure. The whole appears to be inextricably mixed up; for

instance, collection and conversion come under the head Id., and therefore are probably done by departmental agency. On the other hand, cost of storage and sales do not appear separately.

Total Revenue.—Rs. 14,77,650.

Total Expenditure.

A. Conservancy and works,	2,12,022.
B. Establishment	2,68,039.

Total	Rs. 4,80,061.
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Total surplus—Rs. 9,97,595.

Sandal Revenue,  
Rs. 10,03,351.

Sandal Expenditure.  
Rs. 54,374.

Sandal surplus Rs. 9,48,977.

Surplus for the whole of the forests, excluding sandal=48,618.

When we consider that the area of these forests totals some 2700 sq. miles, according to the Report, and that the Conservator has no less than eight district officers to this area, these figures need no comment upon our part, but would seem to require most serious consideration upon that of the Mysore Government. We shall be only too glad to be able to publish a satisfactory explanation of them.

Expenditure under Head VIII (Communications, Construction and Buildings)	...	...	24,751.
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Expenditure under Head VIII (Organisation and Improvements, etc.)	...	...	28,350.
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We are not here particularly concerned with the sandal wood question. If a Government has a gold mine and puts forth its whole strength with the object of working it out in its own time, whilst perhaps this is to be deplored on account of posterity, it does not directly concern outsiders. The above figures and Dr. E. J. Butler's Note\* showing that Mr. Muthannah's opinions upon the spike disease are quite fallacious ones rather tend to prove that the present Mysore Conservator has quite misunderstood the position of the sandal wood case, and it would seem that the tree will soon be a thing of the past in Mysore. The figures show, however, what is in our opinion a much more serious state of affairs. The surplus from the forests proper is only Rs. 48,618, whilst the expenditure on constructions and buildings is only Rs. 27,751, and on organisation, improvement and extension of forests is only Rs. 28,350. Surely these figures speak for themselves, and the more plainly when the Conservator who is responsible for them puts forward in the public press as a sufficient justification of the satisfactory nature of his past year's work that he has a surplus of 10 lakhs of rupees.

\* Views of Dr. E. J. Butler, M.B., F.L.S., on the Report of Mr. M. Muthannah, Conservator of Forests, Mysore, on spike disease in sandal, Appendix Series, Indian Forester, XX, No. 10.

We would venture to suggest that the Mysore Government should call for an exact statement of the expenditure, taking in everything, in their sandal wood areas. If this, with the sandal revenue, is kept entirely apart and worked apart in the future, just as their metalliferous gold mines are, they would then be in a position to see exactly what progress their real forest areas were making. We offer this suggestion in no carping spirit of criticism but simply in the interest of true forest conservancy and in the belief that a Government who has shown the way in so many directions has but to realize the present position of, and the true interests of, its forests for it to give the rest of India a lead in this direction also. Few will agree with the present Conservator that the State is doing so at present.

### **The Timbers of Commerce.**

BY HERBERT STONE, F. L. S., F. R. C. I.

The material for this book was collected by the author, not with a view to publication, but as necessity arose during the conduct of a business in which many different kinds of woods were used and much difficulty was often experienced in distinguishing one wood from another.

The book describes all woods met with on the British market and many others which have been sent from the Colonies as being useful and abundant and likely some day to be of commercial importance. The number of timbers described is 247 and each genus in the descriptive part of the book is represented by a photo-micrograph. These photo-micrographs, of which the book contains over 180, are really excellent and are designed to show the appearance of a transverse section of the wood as seen through an ordinary hand lens magnifying to about three times the actual size. The impressions are beautifully distinct and are capable in many instances of giving, apart from the letterpress, a safe clue to the identification of the wood.

The description given of each wood comprises the natural order, the synonyms and alternative names, the source of supply, the physical characters, uses, colour and the anatomical characters on transverse, radial and tangential sections.

Were all this information correct the book would serve its purpose and be of the greatest use to those who have to handle various sorts of foreign timbers. A cursory perusal of the descriptions of some of the Indian woods, however, has given rise to very grave doubts as to whether many of the descriptions are sufficiently correct to be of any use.

Perhaps the best known timber in Northern India is deodar, and yet Mr. Stone appears never to have come in contact with it, as the only allusion to deodar in the whole book is in the description of *Tascus baccata*, where mention is made that the Yew is called deodar in some parts of the Himalayas.



Again, Padouk is said to be *Pterocarpus indicus* with a synonym *Pterocarpus dalbergioides*. It has long been known that they are different species and the timbers have quite different properties and characteristics, so much so that the Ordnance Department will accept the one and not the other. The Padouk exported from the Andamans is *P. dalbergioides*, and this is the one which a person engaged in the home timber trade is most likely to come across.

Camwood or Barwood is said to be very similar to East Indian Sandal-wood. As Camwood is used as a dye-wood, is reddish-orange in colour and gives a claret-coloured solution, it cannot be very like Sandal-wood, although it may very closely resemble Red Sanders, which is *Pterocarpus santalinus* and not *P. santalinoides*.

Margosa or Margose, as it is called by Mr. Stone, is *Melia indica*, and quite a different tree from *M. azadirachta*. Even the description of teak is open to objection. Under physical characters it is said, "smell characteristic and powerful, like old shoe-leather, very offensive when being worked." Hardly a good description of the characteristic odour of teak. Anamalais teak is said to be known in the timber trade as "stinking teak," but this must be only a relic of former days, as Anamalais teak was all cut out long ago and probably not a single stick has reached Europe during the last quarter of a century.

These are only a few instances of the inaccuracy of some of the information given in a book which, had it been trustworthy, would have been as welcome as it was required.

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## V.-SHIKAR AND TRAVEL.

### **The Indian Pheasants and their Allies.**

By F. FINN, B.A., F. Z. S.

(Concluded)

#### CHAPTER X.

#### THE BUTTON-QUAILS AND MEGAPODE.

I have already, in the beginning of the last chapter, drawn attention to the fact that the Button-Quails or Hemipodes do not belong to the *Phasianidae* at all, not being true quails, and have pointed out their external differences from the latter. To briefly summarise the most striking of these differences again, I may mention that the Indian Button-Quails have no hind toe, and have, in life, distinctly yellowish white eyes, which give them a very different expression. In general habits they resemble the true quails, but the males are always smaller than the females, and are altogether the inferior sex, sitting on the eggs and taking care of the young, while the hens are bold and

pugnacious, fighting like the males of the true quails, and not at all domestically inclined. The Button-Quails can hardly be seriously regarded as objects of sport, but they are good to eat, and probably useful in a humble way as insect-destroyers, as they can attack proportionately larger insects than the true quails, owing to their larger bills.

Three very distinct species are found with us, easily distinguishable by the colour of their legs; but one of these has two sub-species or local races, so that five are usually reckoned. All Button-Quails, it may be added, do well in confinement, most becoming very tame; they are all well worth taking home, as they are seldom procurable in Europe alive.

#### THE BLUE-LEGGED BUTTON-QUAIL.

*Turnix, pugnax* Blanford, Faun. Brit. Ind., Birds, Volume IV, p. 151. Native names:—*Gulu*, *Gundlu*, *Salui-gundru*. Hindi; *Koladu* (male), *Pured* (female). Telugu; *Aukādek* (male), *Kurungkadeh* (female). Tamil; *Durwa*, Ratnagiri; *Kāre-huk*, Kanarese in Mysore; *Timok*, Lepcha; *Ngon*, Burmese. This bird is often called the "Bustard-quail" in books, but the name is distinctly misleading, as this species is as unlike a bustard as are the rest.

The general colouring of the male of this species above is a complicated mixture of brown, black, and white, more reddish in some specimens than in others; below, it is buff, with a whitish throat and black bars across the breast. In the female the throat is black, and the middle of the breast black also to a greater or less extent. Young birds have black spots on the breast instead of bars.

The bill and legs in this species are blue-grey, which, with the barred breast, conspicuously distinguish it.

The cock is six inches long, with a wing of about three inches; the hen about half an inch longer, with a noticeably stronger bill. In captivity I have seen her eat, whole, butterflies two inches across.

This bird is found all over the Empire except in the higher parts of the hills and in Sind and the Punjab; it avoids deserts and heavy forest; out of India it ranges east to China and Formosa. It usually breeds in the rainy season, sometimes simply laying in a hollow, and sometimes making a domed nest. The eggs are usually four, greyish with reddish and brown markings, and nearly an inch long. The variation of colour in this bird follows the climate it inhabits, the darkest and greyest specimens coming from districts where there is a heavy rainfall; these individuals evidently having a constitution more suited for resisting damp. It is, of course, possible that a damp climate may have a direct effect on the plumage, but this could only be established by keeping the reddish specimens from a dry tract in an open-air aviary in a damp district, and observing if they moulted out greyer.

## THE YELLOW-LEGGED BUTTON-QUAIL.

*Turnix tanki*, Blanford, Faun. Brit. Ind., Birds, Volume IV, p. 153.

Native names:—*Lowa*, *Lowa-butai*. Hindi; *Pedda dabagundlu*. This is about the same size as the last species, but is less speckled above and more inclined to a plain drab; moreover at certain seasons, the hens have a chestnut half-collar at the back of the neck. The underparts are buff without bars, but with black spots at the sides of the breast. Young birds are redder and more speckled above. The bill and legs are bright yellow, with a black streak along the ridge of the bill in males.

This bird is found all over India, including Sind, but does not usually range above 4,000 feet in the hills. In April 1898, however, Mr. Goldstein, the Chemist at the Chowrasta in Darjeeling, showed me a live specimen he had captured there under very peculiar circumstances: it was flying round and round a lamp where he used to catch moths, and he caught it in a butterfly-net.

Its breeding time is in July and August in Upper India, but in Mysore about April, and its eggs are of a similar type to those of the last species. Mr. D. Seth-Smith has bred it in England, and finds the incubation-period to be only twelve days, whereas the equally small Painted Quail takes three weeks. The hen Button-quail is so masculine in her character that during courtship she gives her mate any tit-bit she may obtain, just as the common cock and some others of the true game-birds do with their females! Moreover, she does not care at all for her young, but eats the food they ought to have.

It was Mr. Seth-Smith who found out that the chestnut collar of the female was merely her full dress, whereas students of skins had considered it a sign of age—a fact which shows the importance of the study of living birds, even if they have to be kept in captivity.

## THE BURMESE YELLOW-LEGGED BUTTON-QUAIL.

*Turnix blanfordi*, Blanford, Faun. Brit. Ind., Birds, Vol. IV, p. 156.

Native name:—*Ngon*, Burmese.

This is hardly a distinct species, but merely a large local race of the last one, the females being seven inches long as against the six and a half inches of the Indian specimens. The plumage, however, is distinguishable in adult specimens by the greater amount of black barring on the back. This species ranges from Assam and Chittagong to China; of course extending through Burma.

## THE NICOBAR YELLOW-LEGGED BUTTON-QUAIL.

*Turnix albiventris*, Blanford, Faun. Brit. Ind., Birds, Vol. IV, p. 154.

This is another local race of *Turnix tanki*, not exceeding it in size, but more mottled with black and reddish on the back in adults, and with the female's collar of a darker chestnut. It is confined to the Andamans and Nicobars, and rare in the former group of islands. "Species" like this and the last are really better distinguished by the American system of "trinomials" so as to stand as *Turnix tanki blanfordi*, and *T. tanki albiventris*. While it would hardly do to ignore them, I think it is rather absurd to give them full specific rank.

#### THE WHITE-LEGGED OR LITTLE BUTTON-QUAILS.

*Turnix dussumieri*, Blanford, Faun. Brit. Ind., Birds, Vol. IV, p. 152.

Native names:—*Ghinwa lowa*, *Chota lawa*, *Dabki*, *Tura Chimnaj* (in Muttra); *Libbia* (in Purneah). Hindi; *Darwi*, *Ratnagiri*; *Chinna* or *Tella dabba gundlu*, Telugu; *San gundlu*, Uriya.

This species is at once distinguished from the others by its smaller size and lighter colour, besides its funny little pointed tail, which is long enough to be noticeable, while those of our other Button-quails are not so any more than are those of the typical quails. Above it is mostly chestnut mixed with cream-colour, and nearly white below, running into buff on the breast, with black spots on the sides of the latter. Male and female are alike in colour, and the former is in this species not very much the smaller. The bill is blue-grey and the feet fleshy-white. At times I have seen birds of this species in the Calcutta market with blue-grey legs, but in the case of such specimens the characteristic points given above will afford a means of distinction from the blue-legged Button-quail. The hen is five-and-a-half inches long, with a wing of nearly three inches.

This bird inhabits most of India and Burma, but not Ceylon, nor does it seem to occur south of Mysore, nor does it range high up the hills. It extends eastward to Hainan and Formosa. Its breeding season is from April to October, and the eggs, laid in a hollow lined with grass, may sometimes be as many as six. They are stone-coloured with a fine brownish speckling and larger spots of darker brown, and measure about four-fifths of an inch in length. Few birds become so quickly tame in captivity as this funny little creature, which always has a curiously young appearance; in a few days it will allow itself to be touched, and seems quite at home in a cage if allowed plenty of sand to wallow in. Mr. Seth-Smith has had specimens, but did not succeed in breeding from them, possibly because they felt the English climate more than the yellow-legged species.

The last bird I shall have to notice is a much nearer ally to the pheasants than are the Button-quails belonging to the family of Mound-birds (*Megapodiidae*), which are always

acknowledged to be near relatives of the *Phasianidæ*, differing chiefly in their long hind-toe and curious habit of burying their eggs, which disclose full-fledged young.

THE NICOBAR MEGAPODE OR MOUND-BIRD.

*Megapodius nicobariensis*, Blanford, Faun. Brit. Ind., Birds, Vol. IV, p. 147.

In general appearance this bird resembles a large dull-brown partridge, with very short tail and huge legs and feet, of which the hind-toe is large and set on at the same level as the other toes, as in a pigeon. The claws of all the toes are long, broad, and nearly straight. The wings, although of blunt and rounded form, are larger than is usual in partridges. The plumage is plain dull brown, redder above and greyer below, becoming quite grey on the head; there is none of the marking or pencilling usual in partridges. The cock and hen are alike; young ones have no grey tinge below. The skin round the eyes is bare and red. The bill is yellowish or greenish, and the legs horn-colour, becoming reddish at the back; the eyes are brown. The length is sixteen inches, the closed wing measuring nine and the tail three, while the shank is nearly three, and very strong.

This species is confined to the Nicobars, and is a very outlying member of its family, none being found nearer than the Philippines and Celebes, while most of them inhabit the Australian region. Its general habits are those of a jungle-fowl; it is found in pairs or flocks, does not fly unless pressed, and readily perches. It has a cackling note, and feeds both on small animal life and vegetable food, being itself most delicious to eat, according to Mr. Hume, who compares it to a fat turkey and pheasant.

The huge eggs, which are more than three inches long, and pink when new-laid, are buried by the birds in a mound of vegetable matter and sand, which they scratch up in the jungle close to the shore. There their responsibility ceases; the eggs hatch out by themselves in the mound, and the young come out of the egg fledged and able to fly, work their way to the upper air, and go off on their own account; they look not unlike dull-brown quails.

In 1900 four of these birds were presented to the Calcutta Zoological Garden by Colonel Anson, and lived there for some time. These were hatched from eggs which had been taken from a mound in the Nicobars and brought up to the Andamans without any attention at all, so that this species is hardy enough in the egg. The young birds were reared on white ants, and were very tame when they came to Calcutta. The species would be a very good one to acclimatize in any of our insular possessions boasting a warm climate, but I doubt if it could maintain itself on the mainland of India, where jackals and such ground vermin would devastate the mounds.

## VI.—EXTRACTS, NOTES, AND QUERIES.

**A Word For Forestry.**

BY THE HON. GROVER CLEVELAND

*Ex-President of the United States.*

THE centennial celebration of our acquisition of the vast domain included in the Louisiana Purchase suggests certain topics which, though important to other localities and at all times, are peculiarly related to the Western section of our country, and are now more than ever demanding serious attention.

Those most proudly happy in their sanguine Americanism, and most confident of our ability to accomplish all things, must confess that our national life has been habitually beset with careless wastefulness, and that a palpable manifestation of this wastefulness is seen in the destruction of tree growth and the denudation of watersheds on our Western lands. Laws passed with the professed intent of protecting our forests have been so amiably construed as to admit of easy evasion, and their execution has too often been lax and perfunctory. In the meantime, public opinion on this subject, which might be as effective as legal enactment, has comfortably slumbered.

Even if we now abjectly repent of our sins of omission and commission in our treatment of the forests and streams which nature has given us, and reproach ourselves for the neglect of a trust imposed on us for the benefit of future generations, we must at the same time humbly confess that the punishment we have suffered by flood, by drought, by tornado, by fire, by barrenness of soil, and by loss of timber value, is well deserved.

In these circumstances it is exceedingly gratifying to have an appropriate opportunity to congratulate those who have constantly laboured in the cause of forestry and forest preservation, as well as those interested in the cognate subject of irrigation, upon the prospect that these topics are to have more prominent places in governmental care.

Through the teachings of intelligent forestry it has been made plain that in our Western localities ruinous floods and exhausting droughts can be largely prevented, and productive moisture in useful degree and at needed periods secured, by a reasonable and discriminating preservation of our forest areas; the advocates of irrigation have been led to realize that it is useless to provide for the storage of water unless the sources of its supply are protected; and all those who, in a disinterested way, have examined these questions concede that tree growth and natural soil on our watersheds are more valuable to the masses of our people than the footprints of sheep or cattle.

The opportune time has arrived when effective public interest in forestry and forest preservation should be persistently aroused and stimulated.—*The Century Magazine*, Western Number.

**Where are the Largest Trees in the World ?**

BY J. H. MAIDEN.

The record of abnormalities of size of plants, animals, and indeed of any objects, has always had a fascination for the human race. From "Far Cathay," and also from Africa, whence there emerged "always some new thing," travellers brought home extraordinary accounts of the plants they had seen. And, in order to stimulate the public appetite, the travellers whose peregrinations were probably, at the outside, confined to a few English counties, were quite willing, from their tenements in Grub-street, to vastly improve the reports of voyagers. And as sailors are proverbially given to "yarns," it is not surprising that tales in regard to vegetable productions became so extraordinary up to the eighteenth century, that finally no one would own them, and the places of their growth came to be stated with the most delightful vagueness.

A great many tales about Australian vegetation have, from time to time, become current, only to become demolished as the continent became better known. But there is one phase of the subject that is of real scientific interest—I allude to the size of our trees, and in regard to these we have still much to learn. It is very difficult for some people to understand that, in a question of this kind, only actual measurements, by tape or theodolite, or records by an observer of proved accuracy, can be admitted. The mere guessing of heights is rarely attended with even an approximation to accuracy. I have been given the most astounding heights for certain trees, and when I have asked for evidence I have sometimes given offence.

The kudos attaching to the ownership of the largest (highest) tree in the world is usually claimed for California and Australia. We will examine the evidence presently, and I think it will be seen that we know very little about the world's highest trees. It seems a pity that, years ago, before many of the giants were levelled for the necessities of civilisation, scientific measurements were not obtained. There are, however, even yet monarchs of the forest in regard to which these data should be collected.

The greatest claims for Australian trees have been made on behalf of Victoria, most of them from Gippsland. In 1862 Mueller wrote to Seemann's "Journal of Botany" that Mr. D. Boyle, of Nunawading, near Melbourne, had measured a fallen tree in the recesses of the Dandenong, and found it to be 420 feet. About the same time he wrote to the "Australasian" giving more details about this tree, which was stated to be 392 feet long. He added 30 feet as a fair estimate of the length of the top, which had broken off, and thus we have 420 feet as the height of this tree.

Henniker Heaton states that on the Blacks' Spur were two trees, one alive, measuring 420 feet in height, and the other

(prostrate) 480 feet high. He adds that Baron Mueller is the authority for those measurements. One version, therefore, states that the 420-foot tree is prostrate, and the other that it is alive. If these statements are correct, then two trees of this stupendous height are referred to. Following is another account of the 480-foot tree. A note by Mueller in the "Gardeners' Chronicle" for 1862 says that several trees had been recently measured at the Upper Yarra and on the Dandenong. He adds: "The highest known is ascertained to be 480 feet, and therefore as high as the Great Pyramid." The same writer, in Seemann's "Journal of Botany," says that it was a Mr. Klein who measured a tree on the Blacks' Spur, 10 miles from Healesville, and found it to be 480 feet high. Mueller, in his "Select Extra-Tropical Plants," states that a tree was measured in the Cape Otway Ranges 415 feet high and 15 feet in diameter. Another tree measured at the base of the stem 69 feet in circumference; at 12 feet from the ground 14 feet in diameter; at 78 feet 9 feet in diameter; at 144 feet 8 feet in diameter, and at 210 feet 5 feet. All these trees belong to the species described by Mueller as *Eucalyptus regnans*, on account of its crowning height. It is the tree known in Victoria variously as "white gum," "messmate," and "peppermint" (it varies much in the bark), and Mueller alludes to it as "the tallest tree of the globe, surpassing even the renowned California Sequoia and Wellington pines in height, reaching to 400 feet, and even more."

In 1889 the Hon. F. Stanley Dobson, of Melbourne, quoted Mueller as having stated in his "Botanic Teachings" that our gum trees attain a height of 500ft. I cannot trace this particular reference, but I have other references of such a height to which Mueller gave currency. For example, in Seemann's "Journal of Botany" he states that Mr. George W. Robinson, in the back ranges of Berwick, found a tree 81 ft. in girth 4ft. from the ground, and supposes that towards the sources of the Yarra and Latrobe Rivers it attains 500ft.

But we have not reached high-water mark yet. Mr. David Boyle, who for 27 years had been identified with big trees, in 1889 wrote to the Melbourne "Argus" giving 525ft. as the height of a tree known to him some years previously. As this was considered to be rather "tall," and is, I believe, the greatest height in or out of Australia claimed for a tree. Mr. Boyle replied to inquirers: "I determined to have it photographed and measured, 10 years having elapsed since I measured it before . . . I found it. The tree was healthy, the only change in it since I saw it last being that a portion of the top was blown away. The measurement now is 465ft. high, and its circumference 4ft. from the ground 81ft.; base 114ft."

Visitors to the Melbourne International Exhibition of 1888 will remember the photographs of a large buttressed gum-tree by Mr. N. J. Caire, photographer, who stated that he had come across this



monster in Gippsland, and that its height was 464ft. He called it "The Baron," after von Mueller. Here was something very definite to go upon. The Trustees of the Public Library, Melbourne, voted £100, the Trustees of the Exhibition Building another £100, the Minister for Lands promised a sum not exceeding £800, to have this leviathan measured and photographed. After some hesitancy on the part of the photographer, the identical tree photograph was found. The Inspector of Forests and a Government Surveyor measured it accurately, and found it to be 219ft. 9in. Here was a come-down. "No tree in the neighbourhood reached 300ft." The tree, of which a specific measurement was given, was found, on actual measurement, to be less than half its reputed height. The Hon. James Munro, Premier of Victoria, thereupon offered a reward of £100 out of his own pocket for any Victorian tree 400ft. in height—and the reward has remained unclaimed to this day.

It turned out that Mr. Boyle's tree and Mr. Caire's were identical, so that the 525ft.-tree shrank over 300ft. The public interest aroused at the time brought a crop of other guesses and measurements.

Mr. Stanley Dobson, who spent much time trying to get at the truth in regard to these trees, writing to the Royal Society of Tasmania, "believed" that the highest found by a Government Surveyor was near Neerim, in Gippsland, and was 325ft. Even this was excessive, as the "Sydney Morning Herald" of January 21, 1889, gives the height as "227ft. with the top broken off, and a girth 6ft. from the ground of 55ft. 7in." Another tree on the Blacks' Spur, at Fernshaw, had a height of 237ft. 6in., the top being broken off, the girth 6ft. from the ground being 50ft. A still loftier tree reported was that on Mount Monda with a height of 307ft., and a girth 6ft. from the ground of 22ft. 8in. The height given of a tree on Mount Baw Baw is 326ft. 1 in., with a girth 6ft. from the ground of 25ft 7 in.

Next to Victoria the largest Australian trees are claimed on behalf of Tasmania. In the first part of the letters of Quaker Missionary Backhouse there are some measurements of large stringybark trees (*Eucalyptus obliqua*) on the Emu River. I content myself with quoting three. The first was 45ft. in circumference, and the supposed height 180ft., the top broken. The second was 55ft. in circumference; supposed to be upwards of 200ft. high. He measured near Hampshire Hills two trees that had been felled for splitting into rails, each 180 ft. long.

In 1886 the late Mr. Perrin, then Conservator of Forests, Tasmania, reported that one fallen tree that he measured near Geeveston gave the following dimensions: 250 ft. to the first limb, 300ft. to the junction of three limbs forming the head of the tree, 309ft. to the broken stem, which here gave a diameter of over 2ft. The total height of the tree might fairly be placed at 330 ft. At 8 ft. from the ground the circumference was about

40ft. It seems to me that it has not been proved that the largest Victorian tree is larger than the largest Tasmanian ones.

Turning to Western Australia, Mueller, in Seemann's "Journal of Botany," states that Mr. Pemberton Walcott measured a karri (*Eucalyptus diversicolor*) in one of the delightful glens of the Warren River, "where it rises to approximately 400ft."

I do not reconcile these statements as to measurements and approximation. On another occasion "Messrs. Muir saw trees with stems 300ft. long up to the first branch, and I myself noticed many trees which approached to 440ft. in their total height. When closely growing the young trees may have a comparatively slender trunk, so much so that a tree 180ft high may show a stem hardly over a foot in diameter." These figures require verification.

*Eucalyptus marginata*, the Jarrah or mahogany of South-West Australia, is a smaller tree, yet it is said to attain a height of 200ft. (Brown in "Treatise on Tree Culture in South Australia") and a circumference of 32ft. (Mueller).

Some enormous figures are given for the blue gum of Victoria and Tasmania (*Eucalyptus globulus*), viz., height 350ft. (Mueller), 400ft. (Brown), and from 30 to 100 feet in circumference (Brown). I doubt their correctness, and we should not be content with estimates.

The bunya bunya of Queensland (*Araucaria bidwilli*) is stated to grow up to 200ft. I do not know of a reliable record of a New Zealand tree above the same height.

Our own State has had some big trees, but, so far as I know, none so high as the highest of Victoria and Tasmania. In the "Herald" of March 10, 1891, I gave the following figures (actual measurements) of the Bulli big-tree (a blackbutt, *Eucalyptus pilularis*): Girth at ground, measuring from buttress to buttress, 57ft.; 6in.: girth at 3ft. above the ground, 45ft.; and at 6ft., 40ft. The taper is thence very gradual for about 90ft. estimated, where the trunk is broken off, but some of its branches are of the size of small trees. In the "Agricultural Gazette" for 1895 I gave measurements of some large tallowwoods (*Eucalyptus microcorys*) felled for a sawmill at Cooperbrook.

Let us now briefly turn to large non-Australian trees. The baobab (*Adansonia digitata*) is found in tropical Africa, and we have an Australian species (*A. Gregorii*) in North-West Australia. Both are gouty-looking trees, whose diameter is out of all proportion to their height. The height of the African tree is given at from 40ft. to 70ft., and its diameter at 30ft. The largest tree seen in Gregory's Northern Australian expedition was nearly as large, being 85ft. in girth at 2ft. from the ground.

As regards the American trees, I cannot do better than quote the monumental "Silva of North America," by Professor Sargent, which is a work of the highest value. He says: "The redwood (*Sequoia sempervirens*), which is the tallest American

tree, probably occasionally attains the height of 400ft. and more. The tallest specimen I have measured was 340ft. high." This is the timber so well known to us in New South Wales, being the best known tree of Pacific North America. Professor Sargent goes on to say: "Among American trees the redwood is exceeded in size only by *Sequoia Wellingtonia*." Here he differentiates between height and bulk.

Turning to *Sequoia Wellingtonia*, known in California as "Big Tree," Sargent says: "Its average height is about 275ft. and its trunk diameter near the ground 20ft., although individuals from 300ft. to 320ft. tall, with trunks from 25ft. to 35ft. thick, are not rare." Speaking of the celebrated Calaveras trees, he says: "In the Calaveras grove there are three trees over 300ft. high, the tallest measuring 325ft. The largest tree measured by Muir is standing in the King's River forest, and 4ft. above the ground has a diameter of 35ft. 8in. inside the bark."

He also states *Sequoia Wellingtonia* is the largest inhabitant of the American forests, and the most massive-stemmed, although not the tallest tree in the world. In this passage he is not merely indicating that the redwood is a taller tree, but I believe he is referring also to the Australian trees, which he, from reports, believes to be taller.

Professor Sargent is an eminent authority on the subject of which he treats, and in view of the actual measurements that he presents, viz., 340ft. in height for a redwood and a girth round the trunk of 107ft. for its congener, the "Big Tree," I am of opinion that, so far as our knowledge goes at present, California is the home both of the tallest and of the broadest trees in the world.—*The Sydney Morning Herald*.

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THE TREES AND PLANTATIONS OF LHASSA.—The Special Correspondent of the *Pioneer* with the Thibet Mission writes to our contemporary as follows: "The trees and plantations are the saving of Lhasa, and the Thibetans very wisely are tremendously particular about these trees. Every single one, its age, size and approximate location, is entered into a huge register, and an annual comparison is made by responsible officers to see that none have been cut." This reads rather like the Domesday Book of the early Norman days in England. One would, however, have liked to have heard something more about these trees, the species, method of growth, use to which put, etc.; above all, one would like to hear more about that system of supervision which one gathers is so perfect that illicit felling is practically non-existent. The Thibetan Forest Department has apparently solved a question for which its Sister Department in India have in vain looked for a solution.

**ACCLIMATISATION OF THE AMERICAN RED OAK IN NORMANDY.**—Our enlightened contemporary, the *Revue des Eaux et Forêts*, has the following note upon this subject: "From a communication made to the *Société d'Etude des Sciences Naturelles d'Elbœuf* by M. Hickel, Inspector of Forests, Professor at the Grignon Agricultural College, it appears that natural regeneration from (*semis*) sowings of seed of the American red oak (*Quercus rubra*) is easily and abundantly produced in the neighbourhood of Rouen. This species may, therefore, now be definitely considered as included in the flora of Normandy. This point is not without importance, since the red oak, independent of the beauty it possesses as an ornamental tree, has two great advantages over the indigenous ones—the first that it is less exacting in the quality of the soil it demands, which enables it to occupy and thrive on fairly poor sandy soils, and the second that it grows much quicker than its indigenous confrères, and thus is able to fight on more equal terms against the quickly-growing birch."

We may add that the Prussians have also discovered these qualities in the American oak, and it is being planted to a considerable extent in some of the forests of N.-E. Prussia. In the Frienwalde Forests we saw some young plantations containing mixed *Q. Robur* and *Q. Americana*. The latter were half as large again as the European species.

**THE KISTNA FLOODS OF OCTOBER 1903 AND FREE GRANTS OF FOREST PRODUCE.**—Through the courtesy of the Board of Revenue, Madras, we have received a copy of the returns showing the amounts of forest produce granted free to villagers who suffered from the Kistna floods of 1903. From the table we find that grants of timber, firewood and free-grazing were made to the value of Rs. 2,442 from the Bezwada, Bunder, Guntur and Sattenapalli Ranges of the Kistna District. We note this with the greater pleasure, since it exemplifies in a most distinct manner the great utility of the forests in those sudden calamities, involving the destruction of homes and, in all probability, crops, to which the vicissitudes of the Indian climate exposes those who can the least bear to suffer sudden heavy losses. We should like, however, to learn whether it would not be possible by planting operations to reduce to a minimum in this locality disasters of this nature.

**THE INDIA RUBBER TRADE, 1890-1904.**—In an editorial our contemporary, *The India Rubber World*, writes as follows:—Even the most cursory review of the rubber interest for the last fifteen years reveals a period of remarkable growth. Not the least interesting developments have been in connection with the production of crude rubber. While the Amazon valley has continued the leading source of supplies, the vast rubber fields of Africa, practically unknown fifteen years ago, have been developed

on a large scale, and the rubber from there, at first badly prepared, and received by the manufacturers with distrust, has become better in quality and finds a ready market at prices often on a par with the Para grades. During this period also has come an extended interest in rubber culture in Mexico and Central America, and in the Far East, resulting in the planting of millions of thrifty trees, the oldest of which are now beginning to produce rubber profitably. The attempts to "corner" crude rubber during this period, made by Vianna and Flint, and the spectacular failure of both, are matters of history. In connection with crude rubber supplies, reclaimed stock should be taken into account, and in this line the progress has been most satisfactory, better grades being manufactured, and nearly everything in the way of vulcanized scrap now being recovered.

In the way of rubber machinery nothing revolutionary has occurred, although many new machines for specific uses have been invented and are in successful operation. The ordinary factory equipment to-day as compared with that of a decade and a half ago is notable as being much heavier and of greater capacity. At no time in the history of the industry have there been such heavy, large hydraulic presses, so many large calenders, and mills.

As for the manufacture of rubber goods, the greatest progress in any one line in volume of business, and in new and interesting products, has been, of course, in the way of mechanical rubber goods. The most important development in this line is the large production of rubber tires, first introduced on a practical basis within fifteen years. The invention of the pneumatic bicycle tire, its wonderful sudden development, and the final settling down into a staple business, will long be remembered as one of the spectacular incidents of the rubber trade. The growth of the solid vehicle tire in public favour, although it has been slower, is equally interesting, while the production of the many types of automobile tires has taxed the ingenuity and the capacity of the brightest minds in the trade.

In the line of rubber footwear the growth of the business has been remarkable, and it would seem almost as if it had outpaced the needs of the market. The specific changes in this line have been the general substitution of the wool boot, with rubber over, for the rubber boot, in the North-Western United States and the general introduction of the tennis shoes throughout the American market. Appertaining to footwear, there may also be noted the rubber heel, which was long looked upon as a fad, but is now considered a staple product.

In the line of rubber clothing the trade has witnessed the remarkable growth in America of the gossamer rubber garment and its subsequent extinction. This was followed by the mackintosh, which, together with the shower-proof garment of the

cravenette order, may be reckoned upon as having a large and steady market.

In druggists' sundries the general business has increased notably, and the tendency has been to make goods of finer finish with more artistic lines, and packed with an eye to artistic effect. Close to this line is the manufacture of dipped goods, in which there has been a remarkable growth in the United States, and lines of goods produced which have captured the markets of the world.

Fifteen years ago there were not a few who believed that celluloid products would soon displace hard rubber. That prophecy, however, has had no fulfilment, nor has any substitute been found for the better grades of hard rubber. The business has shown a steady normal growth, and particularly in electrical lines has it had many interesting developments.

In the production of insulated wire and cables the growth has been much larger, though the United States has not thus far become an important factor in deep sea cable work. This country has never paid the attention to gutta percha that the rest of the world has, except, during the last few years, in the line of golf balls. Here have been surpassed the expectations of those interested in the production of sporting goods, the American ball leading the world.

While this rather cursory review relates more directly to the industry in the United States, with which *The India Rubber World* is most closely concerned, it is more or less applicable to the rubber industry as a whole. Elsewhere, the most marked development in the volume of trade has been in Germany, which has attained within recent years a much more important relative rank among rubber-manufacturing countries. The benefits to the industry there which have resulted from the close relation of the trained chemist to the factory have not been without an influence upon the industry in all other countries.

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**RUBBER CULTIVATION IN BURMA.**—The prospects of the rubber plantations becoming successful industries in Burma seem to be excellent. A Rangoon firm which took up 2,000 acres in the Shwegyin sub-division has applied for 5,000 acres in addition to extend their plantation. Good roads are badly wanted in that part of the province, for as yet, though only a few miles from the railway, they are cut off from it most of the year by thick jungle or impenetrable swamps. Another Rangoon firm has a rubber plantation near the Leiklho hills in Toungoo district, which is most favourably situated as regards water supply, and the plants of two and three years' growth are in excellent condition. Besides these two plantations, financed by Europeans, many Burmese and Karens have small plantations, and the Government plantation in Mergui district should soon be in a position to export rubber. In

view of the rising prices of rubber in the markets of the world there seem to be excellent prospect for the Burma rubber plantations.

**THE TIMBER OF WESTRALIA.**—The Royal Commission which was appointed in June last year to inquire into and report on the Western Australian forests has presented its report. The questions submitted to the Commission are dealt with as follows:—

Recent estimates give the world's forest area at about 2,500,000,000 acres. Only a small proportion of this, however, yields timber suitable for export. There are, however, very few merchantable timbers in the world which do not, in a greater or lesser degree, come into competition with jarrah or karri. The cost of handling, transporting and working these heavy woods enables the soft woods, especially Oregon pine, to compete against them for some purposes inside the State itself, even to the very borders of our forests. Soft woods, as long as supplies are available, must maintain their advantages for superstructure all the world over, while for street-paving and railway purposes, creosoted pine is a keen competitor with jarrah.

The evidence of Messrs. Davies and Temperley seemed to imply serious injury to the jarrah and karri trade through the competition of the as yet undeveloped forest resources of Borneo and the Philippine Islands; and it cannot be doubted that valuable timbers, in considerable quantities, exist in these lands. But the as yet unknown factor is the question of the cost of extracting timber from the tropical jungle, often extremely mountainous, and placing it on rail or water. The competing hard woods of the Eastern States are considerable in quantity; but evidence is somewhat conflicting as to their competing against jarrah and karri for export.

The first progress report gives the estimate of virgin jarrah forest to the north of the Blackwood River, and suitable for milling at about 2,000,000 acres—equivalent to about thirty-two years' supply, based on the present rate of cutting (about sixty thousand acres per annum, yielding an average of 3·1 loads per acre). To the south of the Blackwood there are considerable supplies of this timber, but, being so constantly intergrown with karri, blackbutt, and red gum, no fair estimate of quantities can be given. In addition to these areas, there are several millions of acres of jarrah country, not of sufficient commercial value for milling purposes, but which will, as the railway system develops, afford immense scope for sleeper-hewing, an instance of which will be afforded by the construction of the Collie-Narrogin Railway.—*Timber Trades Journal*.

## VII.—TIMBER AND PRODUCE TRADE:

**Churchill and Sim's Wood Circular.***4th October, 1904.*

**EAST INDIA TEAK.**—The deliveries for September this year are 434 loads against 779 loads in September, 1903, making the total for nine months 7,213 loads, against 8,382 loads last year. The demand, as these figures show, continues very small, but holders are content to wait for it, and prices are fully maintained.

**CEDAR—EAST INDIA.**—Is practically unsaleable. — **PENCIL CEDAR.**—Large prime logs would sell well, but other sorts are not wanted.

**ROSEWOOD—EAST INDIA.**—Stocks are increasing, as at the moment there is very little demand.

**SATINWOOD—EAST INDIA.**—Is in very limited demand, and sales are not easily made.

**EBONY—EAST INDIA.**—Is not wanted.

**PRICE CURRENT.**

Indian teak, logs, per load ..	... £10 to £18
„ „ planks, „ ...	... £12-10s. to £20
Pencil Cedar per foot cube ...	... 2s. to 4s.
Rosewood „ ton ...	... £6 to £10
Satinwood „ s. ft. ...	... 7d. to 18d.
Ebony „ ton ...	... £5 to £10.

**Denny, Mott and Dickson, Limited.****WOOD MARKET REPORT.***London, 3rd October, 1904.*

**TEAK.**—The landings in the docks in London during September consisted of 265 loads of logs and 261 loads of planks and scantlings, or a total of 526 loads, as against 1,362 loads for the corresponding month of last year. The deliveries into consumption were 212 loads of logs and 266 loads of planks and scantlings—together 478 loads, as against 847 loads for September, 1903.

The dock stocks at date analyse as follows:—

	5,683 loads of logs, as against	6,242 loads at the same date last year.		
	3,920 „ planks, „	3,619 „	„	„
<b>Total</b>	<b>9,603 loads</b>	<b>9,861 loads</b>	<b>„</b>	<b>„</b>

Business in teak has been quite insignificant in respect to actual consumption, but increasing prices have had to be paid for such sales as were made. Stocks continue to shrink, and shippers remain confident of marketing their small supplies in India at rates which merchants and dealers on this side dare only face up



to when they have actual forward orders for consumption in hand. Modest supplies from Bangkok may be expected during next year; but the market for Burma wood promises to remain in so abnormal a position respecting supplies that any demand for Rangoon and Moulmein timber will have to be specially arranged for shipment as it arises, the stocks of these descriptions in Europe being entirely inadequate to supply even the usual demand for naval purposes. These considerations point to a distinct appreciation in the value of the Bangkok supplies.

In respect to volume, the business of last month has perhaps been the worst of the year. Nevertheless, there has been a marked steadiness in prices all round as, short of a financial panic, it is increasingly recognised that there is nothing in sight to further lower f. o. b. prices or freights. It only remains that the position should improve all round, always subject to stocks not being thrown on the market, through the exigencies of weak holders, towards the end of the remaining quarter of a very trying year.

## VIII.—EXTRACTS FROM OFFICIAL GAZETTES

### 1.—GAZETTE OF INDIA.

28th October, 1903.—No. 1269—197-7-F.—In consequence of the death of Mr. H. D. D. French, Officiating Conservator of Forests, 3rd grade, United Provinces, Mr. L. Mercer, Deputy Conservator, 2nd grade, United Provinces (on deputation to the Government of India), is appointed to officiate in the 3rd grade of Conservators, with effect from the 4th September 1903, but to remain *seconded* as Assistant Inspector-General of Forests and Superintendent of Working-plans.

No. 1273—197-8-F.—Mr. C. E. Muriel, Deputy Conservator of Forests, 2nd grade, Burma, is appointed to officiate as Conservator, 3rd grade, with effect from the 26th September 1903, the date on which he took over charge of the Oudh Circle, United Provinces.

No. 1276—188-20-F.—(i) Mr. E. G. Chester, Conservator of Forests 2nd (officiating 1st) grade, Central Provinces, is transferred to the Punjab Forest Circle, of which he received charge from Mr. F. Beadon-Bryant, Conservator, 2nd grade, on the afternoon of the 24th September 1903.

(ii) Mr. F. Beadon-Bryant is transferred to the Southern Circle, Upper Burma, of which he received charge from Mr. J. Copeland, Officiating Conservator, on the forenoon of the 19th October 1903.

From the same date, Mr. J. Copeland reverted to his substantive appointment of Deputy Conservator, 1st grade, Burma.

(iii) Mr. A. W. Blunt, Deputy Conservator of Forests, 3rd (officiating 2nd) grade, Central Provinces, in charge of the current duties of the Conservator's Office, Northern Circle, Central Provinces, is appointed to officiate as Conservator, 3rd grade, in charge of that Circle, with effect from the 19th October 1903, until further orders.

12th November 1903.—No. 3924-2-12.—The services of Mr. E. P. Stebbing, Deputy Conservator of Forests, who was appointed to officiate as Superintendent of the Natural History Section, Indian Museum, are replaced at the disposal of the Government of Bengal, with effect from the date on which Major Alcock, I. M. S., resumes charge of his duties as Superintendent.

19th November 1903.—No. 1348-F—217-5.—The following promotions are made with effect from the 13th October 1903, in consequence of the death of Mr. F. B. Dickinson, Conservator of Forests, 1st grade:—

- (3) Mr. E. F. Fernandez, Conservator, 2nd (officiating 1st) grade, Berar, is confirmed in the latter grade.
- (ii) Mr. F. B. Beadon-Bryant, Conservator, 2nd grade, Upper Burma, to officiate as Conservator, 1st grade.
- (iii) Mr. F. A. Hauxwell, Conservator, 3rd (officiating 2nd) grade, Upper Burma, is confirmed in the latter grade.
- (iv) Mr. H. Slade, Deputy Conservator, 1st grade, Burma, on privilege leave, is appointed to be Conservator, 3rd grade, and to officiate in the 2nd grade of that class.
- (v) Mr. T. J. Campbell, Deputy Conservator, 1st grade, United Provinces, to officiate as Conservator, 3rd grade, in charge of the Central Circle in those Provinces.

### 2.—MADRAS GAZETTE.

23th October 1903.—No. 426.—M. R. Ry. Thummaji Rao Bapu Rao, Extra Assistant Conservator of Forests, to act as District Forest Officer, Cuddapah, during the absence of Mr. J. S. Scot on privilege leave.

30th October 1903.—No. 432.—Mr. Arthur Pascal Grenfell, Deputy Conservator of Forests, Madras, has been granted by the Right Honourable

the Secretary of State for India an extension of leave on medical certificate for six months.

*2nd November 1903.—Leave.*—M. R. Ry. T. V. Sakkoji Row, Ranger, 5th grade, Kurnool district, is granted privilege leave for three months from date of relief, under Article 260 of the Civil Service Regulations.

*2nd November 1903 — Transfers.*—The following transfers are ordered to take effect from date of return of Ranger T. V. Sakkoji Row from three months' privilege leave granted in this office Service Order No. 188 of 1903 :—

T. V. Sakkoji Row, Ranger, 5th grade, from Kurnool to Anantapur district.

P. Ramaaswami Iyer, Deputy Ranger, 1st grade, and acting sub, *pro tem* Ranger, 6th grade, from Kistna to Kurnool.

*5th November 1903.—Confirmation of Appointment.*—K. Chengappa, Probationary Ranger, 6th grade, Godavari district, is confirmed with effect from 31st March 1903.

*9th November 1903.—No. 437.*—Mr. Samuel Charles Moss, Extra Assistant Conservator of Forests, is granted privilege leave for six weeks, with effect from date of relief, under Article 260 of the Civil Service Regulations.

*11th November 1903.—No. 443.*—Mr. Claude duPre Thornton, Deputy Conservator of Forests, Madras, has been granted by the Right Honourable the Secretary of State for India extension of furlough to 24th December 1903 inclusive.

*11th November 1903.—Leave.*—Under Article 260 of the Civil Service Regulations, the Board of Revenue has granted privilege leave for one month to M. R. Ry. C. M. Maduranayagam Pillai Avargul, Extra Assistant Conservator of Forests, with effect from 24th November 1903, with permission to avail himself of the Christmas holidays in continuation of the leave.

### 3. — BOMBAY GAZETTE.

*27th October 1903.—No. 7495.*—His Excellency the Governor in Council is pleased to cancel so much of Government Notification, Revenue Department. No. 7150, dated 13th October 1903, as relates to the appointment of Mr. H. Murray to be Divisional Forest Officer, S. D. Kanara, and to hold charge of that office in addition to his own duties.

*4th November 1903.—No. 7693.*—Mr. D. M. Damle, Sub-Divisional Forest Officer, Nasik, passed on the 18th September 1903 an examination in subjects prescribed in No. VI of the Rules published in Government Notification No. 2, dated 3rd January 1894, for the examination of officers of the Forest Department.

2. Mr. Damle passed an examination in Gujarati according to the Lower Standard on 19th September 1903.

*5th November 1903.—No. 1973.*—Mr. E. M. Hodgson, acting Deputy Conservator of Forests, 3rd grade, delivered over, and Mr. C. G. Dalia, Extra Assistant Conservator of Forests, 2nd grade, received charge of the Divisional Forest Office, Surat, and the office of the Assistant Political Agent, Danga, on the 16th of October 1903, in the afternoon.

*12th November 1903 —No. 2579.*—Messrs. A. G. Edie, Deputy Conservator of Forests, 3rd grade, and J. D. Maitland-Kirwan, Assistant Conservator of Forests, 2nd grade respectively delivered over and received charge of the Divisional Forest Office, East Khandesh, on the afternoon of 2nd November 1903.

*16th November 1903.—No. 6591.*—Mr. O. H. L. Napier, Deputy Conservator of Forests, delivered over, and Mr. G. E. Marjoribanks, Assistant Conservator of Forests, received charge of the Northern Forest Division of Kanara on the forenoon of the 5th November 1903.

24th November 1903.—No. 8251.—Mr. W. G. Betham, Deputy Conservator of Forests, 1st grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

#### 4.—BENGAL GAZETTE.

9th November 1903.—No. 3108.—Mr. A. L. McIntire, Officiating Conservator of Forests, Bengal, received charge of the Direction Division from Mr. F. Trafford, Deputy Conservator of Forests, on the afternoon of the 19th October 1903.

Mr. F. Trafford, Deputy Conservator of Forests, was relieved of his duties as Personal Assistant to the Conservator of Forests, Bengal, on the afternoon of 30th October 1903, on his transfer to the Jalpaiguri Division, of which he took over charge from Mr. W. M. Green, Deputy Conservator of Forests on the afternoon of 31st idem.

21st November 1903.—No. 3381.—Mr. E. P. Stebbing Deputy Conservator of Forests, Bengal, is granted combined leave for six months, with effect from the 19th November 1903, viz, privilege leave for three months under articles 233 and 260 of the Civil Service Regulations, and furlough for the remaining period under article 308 (v) of the Civil Service Regulations.

#### 5.—UNITED PROVINCES GAZETTE.

28th October 1903.—No. 4640—II 1429c.—Mr. E. A. Courthrope, Assistant Conservator of Forests, attached to the Naini Tal Division, Central Circle, to be attached to the Garhwal Division of the same Circle.

#### 6.—PUNJAB GAZETTE.

10th November 1903.—No. 493 A L—No. 20.—Messrs. E. M. Coventry and A. J. Gibson, Deputy Conservators of Forests, respectively made over and received charge of the Kulu Forest Division on the afternoon of the 26th October 1903, on and from which date the former proceeded on three months' privilege leave combined with nine months' furlough granted to him by the Chief Commissioner. Assam, to which Province he has been transferred.

10th November 1903.—No. 497 A-L—No. 21.—Messrs. J. C. Carroll and E. M. Coventry, Deputy Conservators of Forests, respectively made over and received charge of the Kulu Forest Division on the forenoon of the 22nd October 1903, consequent on the former's departure on 2 months and 25 days privilege leave.

#### 7.—CENTRAL PROVINCES GAZETTE.

24th October 1903.—No. 4833.—Mr. C. O. Hanson, Deputy Conservator of Forests, Sconi Forest Division, has been granted, by His Majesty's Secretary of State for India, six months leave on medical certificate in extension of the leave granted him by Revenue Department Order No. 6790, dated the 13th December 1902.

27th October 1903.—No. 11.—K. Rama Rao, Ranger, 1st grade, attached to the Nagpur-Wardha Division is granted three days' privilege leave in extension of that granted him by Departmental Orders Nos. 80 and 132 of the 22nd July and 8th October 1903, respectively.

29th October 1903.—No. 75.—Privilege leave for one month and eight days on full pay, under Articles 260 and 262 of the Civil Service Regulations, is granted to Deputy Ranger Bhagaram, Ellichpur Division, with effect from the 17th October 1903.

2nd November 190—No. 467.—A-L No. 19.—Mr. A. V. Monro, Deputy Conservator of Forests, returned from leave and took over charge of the Hazara Forest Division on the forenoon of the 19th October 1903, relieving Mr. A. J. Gibson, Deputy Conservator of Forests, transferred to the Kulu Forest Division.

4th November 1903.—No. 79.—Six months' extraordinary leave under Article 339 of the Civil Service Regulations, is granted to Deputy Ranger

Bhairon Singh, in continuation of the leave granted to him in Forest Orders Nos. 11, 76 and 63, dated respectively, the 11th May 1902, 29th October 1902 and 16th September 1903.

9th November 1903.—No. 82.—Deputy Ranger Lad Khan, Buldana Division, is granted privilege leave on full pay for two months under Articles 260 and 262 of the Civil Service Regulations, with effect from the 1st December 1903.

10th November 1903.—No. 5048.—Privilege leave for two months and twenty-eight days, under Articles 246 and 260 of the Civil Service Regulations, is granted to Mr. S. R. Parsons, Extra-Assistant Conservator of Forests, Nimar, with effect from the 16th November 1903, or the subsequent date on which he may avail himself of it.

18th November 1903.—No. 5196. On return from leave granted him by Order No. 2086, dated the 21st May 1903, Mr. A. P. Percival, Officiating Deputy Conservator of Forests, is posted to the charge of the Balaghat Forest Division.

No. 5197.—On being relieved by Mr. A. P. Percival, Mr. Kenny, Deputy Conservator of Forests, is transferred to the Northern Chanda Forest Division.

### 8.—BURMA GAZETTE.

21st October 1903.—No. 17.—With reference to Revenue Department Notification No. 396 (Forests), dated the 3rd October 1903, Mr. W. R. French, Extra Assistant Conservator of Forests, made over, and Mr. J. C. Hopwood, Assistant Conservator of Forests, received, charge of the South Tharrawaddy subdivision on the forenoon of the 19th October 1903.

21st October 1903.—No. 18.—With reference to Revenue Department Notification No. 391 (Forests), dated the 3rd October 1903, Mr. L. C. Davis, officiating Deputy Conservator of Forests, made over charge of the North Tharrawaddy subdivision to Mr. W. R. French, Extra Assistant Conservator of Forests, as a temporary measure, on the afternoon of the 16th October 1903.

23rd October 1903.—No. 21.—Mr. S. E. F. Jenkins, Extra Assistant Conservator of Forests, returned from the two and a half months' privilege leave granted him in Revenue Department Notification No. 296 (Forests), dated 29th July 1903, and assumed charge of his duties in the Gangaw subdivision, Yaw Forest Division, on the forenoon of the 17th October 1903.

23rd October 1903.—No. 19.—With reference to Revenue Department Notification No. 391 (Forests), dated the 3rd October 1903, Mr. L. C. Davis, officiating Deputy Conservator of Forests, assumed charge of the Bassein-Myaungmya Division on the afternoon of the 21st October 1903, relieving Mr. H. B. Ward, Deputy Conservator of Forests.

26th October 1903.—No. 20.—Mr. R. C. A. Pinder, Extra Assistant Conservator of Forests, reported his return from the three months' privilege leave granted him in Revenue Department Notification No. 198 (Forests), dated 3rd June 1903, on the forenoon of the 15th October 1903 and assumed charge of his duties in the Shweli subdivision, Ruby Mines Forest Division, on the forenoon of the 16th October 1903.

27th October 1903.—No. 422.—On return from leave Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests, is posted to the charge of the West Salween Division *vice* Mr. A. E. Ross; Deputy Conservator of Forests transferred.

27th October 1903. No. 423.—On relief by Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests, Mr. A. E. Ross, Deputy Conservator of Forests, is attached to the Thauingyin Division for Working-plans duty.

27th October 1903.—No. 424.—Mr. E. M. Buchanan, Extra Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of one week's extraordinary leave without pay and has been permitted to return to duty within the period of his leave.

29th October 1903.—No. 426.—On return from leave Mr J L Heffernan, Extra Assistant Conservator of Forests, is posted to the charge of the Shwegu subdivision, Bhamo Division.

31st October 1903.—No. 429.—With reference to Revenue Department Notification No 392 (Forests), dated 3rd October 1903, Mr. H B Ward, Deputy Conservator of Forests, assumed charge of the Rangoon Division on the afternoon of 26th October 1903, relieving Mr. S. Carr, Deputy Conservator of Forests.

31st October 1903.—No. 428.—Mr. J. Copeland, Deputy Conservator of Forests, on being relieved of the charge of the Southern Circle, is posted to the charge of the Mandalay Division.

31st October 1903.—No. 20.—On relief by Mr. J. Copeland, Deputy Conservator of Forests, Mr. A. Lawrence, officiating Deputy Conservator of Forests, is transferred from the Mandalay Division and is posted to the charge of the Magwe subdivision, Minbu Division.

4th November 1903.—No. 21.—With reference to Revenue Department Notification No. 406 (Forests), dated the 15th October 1903, Mr E M. Buchanan, Extra Deputy Conservator of Forests assumed charge of the Henzada-Thongwa Division on the afternoon of the 31st October 1903 relieving Mr. H. W. A. Watson, officiating Deputy Conservator of Forests,

5th November 1903.—No. 432.—Mr. D. H. Allan, Extra Assistant Conservator of Forests, is transferred from the Thauingyin Forest Division and is appointed to be Personal Assistant to the Conservator of Forests, Teyasserim Circle

6th November 1903.—No. 22.—With reference to Revenue Department Notifications Nos. 393 and 394 (Forests), dated the 3rd October 1903, Mr. R. E Marsden, Officiating Deputy Conservator of Forests, made over, and Mr. S. Carr, Deputy Conservator of Forests, received charge of the Pyinmana Forest Division on the afternoon of the 30th October 1903.

9th November 1903.—No. 435.—The following alterations in rank are ordered in the Forest Department:—

- (1) With effect from the 18th September 1903, consequent on the appointment of Mr. C. E. Muriel as officiating Conservator.—

Mr. G. F. R. Blackwell, Deputy Conservator of Forests, 2nd grade *prov. sub.*, to officiate as Deputy Conservator, 1st grade.

Mr. C. W. A. Bruce, Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. F. H. Todd, Assistant Conservator of Forests, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade

- (2) With effect from the 19th September 1903, consequent on the return from leave of Mr. A. H. M. Lawson, officiating Deputy Conservator, 3rd grade.—

Mr F H Todd, Assistant Conservator of Forests, 1st grade (officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

13th November, 1903.—No. 23.—With reference to Revenue Department Notification, Nos. 428 and 429 (Forest) dated 31st October 1903, Mr J. Copeland, Deputy Conservator of Forests, relieved Mr. A Lawrence, officiating Deputy Conservator of Forests, of the charge of the Mandalay Forests Division on the afternoon of the 19th October 1903.

13th November 1903.—No. 24.—With reference to Revenue Department Notification No. 429 (Forests), dated 31st October 1903, Mr. A Lawrence, Officiating Deputy Conservator of Forests, assumed charge of his duties in the Magwe subdivision, Minbu Division, on the afternoon of the 30th October 1903.

16th November 1903.—No. 4.—With reference to Revenue Department Notification No. 428 (Forests), dated the 29th October 1903, Mr J. L. Heffernan, Extra Assistant Conservator of Forests, reported his return from leave at Bhamo on the forenoon of the 9th November 1903, and

received charge of the Shwegu subdivision from Mr. G. F. R. Blackwell, Deputy Conservator of Forests, on the forenoon of the 10th November 1903.

16th November 1903.—No. 445.—With reference to Revenue Department Notification No. 414 (Forests), dated the 22nd October 1903, the headquarters of Mr H. W. A. Watson, officiating Deputy Conservator of Forests, will be at Rangoon so long as he is employed on Working-plant duty in the Shwegyin Division.

9.—ASSAM GAZETTE.

6th November 1903.—No. 9533G.—Mr. G. M. Townshend, Assistant Conservator of Forests, attached to the Darrang Forest Division, is temporarily transferred and attached to the Kamrup Forests Division for duty in the Kulsi Range.

10.—MYSORE GAZETTE.—*Nil.*

## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

27th November 1903.—No. 1375-F.—94-7.—The following transfers are made in the interests of the public service :—

(i) Mr. J. E. Barrett, Deputy Conservator of Forests, from Assam to the Punjab.

(ii) Mr. E. M. Coventry, Deputy Conservator of Forests, from the Punjab to Assam.

10th December 1903.—No. 1432-F-173-9.—Mr. H. Slade, Conservator of Forests, 3rd (officiating 2nd) grade, on return from the privilege leave granted to him in the Notification of this Department No. 875-173-4 dated the 6th August 1903, resumed charge of the Pegu Circle, Lower Burma, on the forenoon of the 20th November 1903, relieving Mr. A. F. Gradon, officiating Conservator, 3rd grade.

From the same date Mr. Gradon was transferred to the charge of the Northern Circle, Central Provinces, of which he relieved Mr. A. W. Blunt, officiating Conservator, on the forenoon of the 30th November 1903, the latter officer reverting to his substantive appointment.

18th December 1903.—No. 1457-F-149-13.—The undermentioned officers, who have been appointed by His Majesty's Secretary of State to the Forest Department of India, are appointed to be Assistant Conservators, 2nd grade, with effect from the dates specified opposite their names, and are posted to the provinces named below :—

Mr. C. G. Trevor, Punjab	..	24th November 1903.
" F. Canning, United Provinces	..	24th " "
" T. Carr, ditto	..	24th " "
" J. Donald, Central Provinces	..	24th " "
" F. W. Collings, Burma	..	28th " "
" S. F. Hopwood, do.	..	28th " "
" P. Tinne, Bengal	..	29th " "
" W. R. Le G. Jacob, Bengal	..	29th " "

18th December 1903.—No. 1463-F-188-23 — *Erratum*—In the Notification of this Department No 1276-F., dated the 28th October 1903, for "19th October 1903" in paragraph (iii), substitute "15th September. 1903" as the date on which Mr. A. W. Blunt was appointed to officiate as Conservator of Forests, 3rd grade, in charge of the Northern Circle, Central Provinces.

### 2.—MADRAS GAZETTE.

12th November 1903.—Mr. A. G. VanHaften, Forest Ranger, 1st grade, is granted privilege leave, under Article 260 of the Civil Service Regulations, for three months from date of relief.

23rd November 1903.—*Confirmation of Appointment*.—B. Krishna Row, Probationary Ranger. 6th grade, Bellary district, is confirmed with effect from 31st March 1903.

23rd November 1903.—No. 465.—Mr. Charles Mortimer Hodgson, Deputy Conservator of Forests, 3rd grade, transferred from Burma, to act as District Forest Officer, Cuddapah, to join at once.



30th November 1903.—No. 464.—In modification of the leave granted him in notification No 415, published at page 1143 of Part I of the *Port St. George Gazette*, dated 20th October 1903, Mr. James Stewart Scott, District Forest Officer, Cuddapah, is granted, with effect from 28th October 1903, privilege leave for two months and five days and in continuation thereof furlough on medical certificate for ten months and fourteen days, under Articles 233, 280 and 308 (a) of the Civil Service Regulations.

1st December 1903.—*Leave*.—Syed Yaseem Sahib, Acting Ranger, 6th grade, Godavari district, is granted privilege leave for two months from or after 10th December 1903.

1st December 1903.—*Confirmation of Appointment*.—B. Sanniah, Deputy Ranger, 2nd grade, and Acting Ranger, 6th grade, Anantapur district, is confirmed as Ranger, 6th grade, with effect from 31st March 1903.

8th December 1903.—M. R. Ry. T. Bapu Rao Avargal, Extra-Assistant Conservator of Forests, on relief of the district charge of Cuddapah, to proceed to South Salem division as a temporary measure.

### 3. — BOMBAY GAZETTE.

24th November 1903.—No. 2141.—Mr. V. D. P. Rebeiro, Extra-Assistant Conservator of Forests, 2nd grade, delivered over, and Mr. G. P. Millett, acting Conservator of Forests, 3rd grade, received charge of the office of the Working Plans Division, N. C., on the 16th of November 1903, in the forenoon.

Mr. G. P. Millett, acting Conservator of Forests, 3rd grade, delivered over, and Mr. G. R. Duxbury, acting Deputy Conservator of Forests, 3rd grade, received charge of the office of the Working-plans Division, N. C., on the 17th of November 1903, in the forenoon.

28th November 1903.—No. 8394.—Mr. T. R. D. Bell, Acting Deputy Conservator of Forests, 1st grade, in charge Sind Circle, is granted privilege leave of absence for one month.

15th December 1903.—No. 2754.—Messrs. G. R. Duxbury and A. D. Wilkins, Deputy Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, Poona, on the forenoon of the 16th November 1903.

15th December 1903.—No. 2755.—Messrs. T. B. Fry, Conservator of Forests, C. C., and J. Hodgson, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Working-plans, C. C., on the forenoon of the 24th November 1903.

2nd December 1903.—No. 8483.—Mr. L. S. Osmaston, Deputy Conservator of Forests, 3rd grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

3rd December 1903.—No. 2224.—Mr. C. G. Dalia, Extra-Assistant Conservator of Forests, 2nd grade, delivered over, and Mr. E. M. Hodgson, acting Deputy Conservator of Forests, 3rd grade, received charge of the Divisional Forest Office, Surat, and of the office of the Political Agent, Dangs, on the 28th of November 1903, in the forenoon.

8th December 1903.—No. 7182.—Mr. P. E. Aitchison, Assistant Conservator of Forests, arrived at Belgaum on the 3rd December 1903, before noon, and reported himself for duty on the 5th December 1903, before noon, at Badami.

9th December 1903.—No. 8690.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. L. S. Osmaston, on return to duty, to be Divisional Forest Officer, West Khandesh.

Mr. A. C. Robinson, L. C. E., on relief, to act as Divisional Forest Officer, North Thana, pending further orders.

9th December 1903.—No. 8699.—His Excellency the Governor in Council is pleased to appoint Mr. Chunilal Gulabchand Dalia, L.C.E., to be Extra Assistant Conservator of Forests, Sind Circle.

15th December 1903.—No. 8847.—His Excellency the Governor in Council is pleased to appoint Mr. O. S. McKenzie to act as Deputy Conservator of Forests, 1st grade, and to hold charge of the Sind Circle in addition to his own duties, during the absence on leave of Mr. T. R. D. Bell, or pending further orders.

9th December 1903.—No. 7221.—Mr. H. L. Newman, Acting Deputy Conservator of Forests, delivered over, and Mr. W. E. Copleston, Deputy Conservator of Forests, received charge of the Southern Forest Division of Kanara on the forenoon of 30th November 1903.

#### 4.—BENGAL GAZETTE.

25th November 1903.—No. 3480.—Consequent on the death of Mr. H. D. D. French, Deputy Conservator of Forests, 2nd grade, the following promotions are ordered with effect from the 4th September 1903 :—

Mr. B. B. Osmaston, F.C.S., Deputy Conservator of Forests, 3rd grade, and Officiating Deputy Conservator of Forests, 2nd grade, is confirmed in the latter grade.

Mr. C. C. Hatt, Deputy Conservator of Forests, 4th grade, and Officiating Deputy Conservator of Forests, 3rd grade, is confirmed in the latter grade.

Mr. J. W. A. Grieve, Deputy Conservator of Forests, 4th grade, sub. *pro tem*, is confirmed in that grade.

Mr. T. H. Monteath, Assistant Conservator of Forests, 1st grade, and Officiating Deputy Conservator of Forests, 4th grade, to be Deputy Conservator of Forests, 4th grade, sub. *pro tem*, *vice* Mr. Grieve.

Mr. J. L. Baker, Assistant Conservator of Forests, 1st grade, sub. *pro tem*, and Officiating Deputy Conservator of Forests, 4th grade, is confirmed in the former grade, but will continue to officiate as Deputy Conservator of Forests, 4th grade.

28th November 1903.—No. 3503.—Mr. Guru Das Chatterjee, Extra Assistant Conservator of Forests, attached to the Sonthal Parganas Division, is transferred, as an attached officer, to the Singhbhum Division.

8th December 1903.—No. 3697.—Mr. J. W. A. Grieve, Deputy Conservator of Forests, is, on return from the combined leave granted to him in Notification No. 279 T. R., dated the 28th April 1903, posted to the charge of the Singhbhum Division.

Mr. H. King Robinson, Assistant Conservator of Forests, is, on being relieved of the charge of the Singhbhum Division by Mr. Grieve, transferred to the charge of the Direction Division and appointed to be Personal Assistant to the Conservator of Forests, Bengal.

8th December 1903.—No. 3702.—Messrs. P. Tinne and W. R. LeG. Jacob, appointed by his Majesty's Secretary of State to the Forest Department in Bengal as Assistant Conservators, 2nd grade, are posted to the Darjeeling and Buxa Forest Divisions, respectively, as attached officers.

11th December 1903.—No. 3812.—Mr. T. I. Pocock, Extra Assistant Conservator of Forests, Sunderbans, is transferred to the charge of the Angul Forest Division on expiry of the privilege leave granted to him in Government Notification No. 2214 T. R., dated the 18th September 1903.

Mr. G. A. Hannah, Extra Assistant Conservator of Forests, in charge of the Angul Forest Division, on relief by Mr. Pocock, is transferred to the Sunderbans Division as an attached officer.

## 5.—UNITED PROVINCES GAZETTE.

23rd November 1903.—No. 5015—II/86A-11—The following temporary promotions and reversions are notified for general information :—

Entry No.	With effect from	Consequent on	Name.	From	To
1	14th October 1903.	Mr. T. J. Campbell's appointment as officiating Conservator of Forests.	Mr. W. H. Lovegrove.	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.
			„ J. C. Tulloch.	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.
			„ F. F. R. Chaner.	Officiating Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.
2	21st October 1903.	The return of Mr. P. H. Clutterbuck from leave.	„ J. C. Tulloch.	Officiating Deputy Conservator, 2nd grade.	Deputy Conservator, 3rd grade.
			„ F. F. R. Chaner.	Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 4th grade.

1st December 1903.—No. 5091—II/866C.—Notification No. 4454—II/866C, dated the 14th October 1903, appointing Mr. T. J. Campbell, Deputy Conservator of Forests, Naini Tal Forest Division, Central Circle, to hold charge of the current duties of the office of Conservator of Forests of that circle in addition to his own, *vice* Mr. F. B. Dickinson, deceased, is hereby cancelled.

1st December 1903.—No. 5094—II/851—1.—The following officers who have been appointed to the Forest Department by the Secretary of State for India, and who reported their arrival in Allahabad on the forenoon of the 28th November 1903, to be Assistant Conservators of Forests, 2nd grade, and to be attached to the Forest Divisions noted against their names :—

Mr. F. Canning, Kheri Forest Division, Oudh Circle.

Mr. T. Carr, Naini Tal Forest Division, Central Circle.

18th December 1903.—No. 1318—VII/455 B—24—The undermentioned gentlemen are declared to have passed the departmental examination of junior officers held on 12th October 1903, and following days, in subjects specified below :—

*Procedure and Accounts.*

Babu Tinkari Lahiri.

*Vernacular.*

By the higher standard.

Mr. E. A. Courthorpe.

Saiyad Mahdi Hasan.

19th December 1903.—No. 5333—II/730C—Mr. R. St G. Burke, Assistant Conservator of Forests in charge of the Gonda Forest Division, of the Oudh Circle, on being relieved, examination leave for three months.

22nd December 1903.—No. 5357—II/851—1—Mr. T. Carr, Assistant Conservator of Forests, from the Naini Tal Forest Division of the Central Circle to the Garhiwal Forest Division of the same Circle.

## 6 — PUNJAB GAZETTE.

25th November 1903.—No. 520.—Mr. J. E. Barrett, Deputy Conservator of Forests, Assam, reported his arrival at Bombay on the forenoon of the 16th October 1903, on return from leave. Mr. Barrett reported himself at the office of the Conservator of Forests, Punjab, Lahore, on the forenoon of the 19th idem, and was posted to the Kangra Forest Division, of which he took over charge on the forenoon of the 22nd October 1903, relieving Mr. E. M. Coventry, Deputy Conservator of Forests.

12th December 1903.—No. 559.—Khan Bahadur Munshi Fazl Din and Pandit Gokal Das, Extra-Assistant Conservators of Forests, respectively made over and received charge of the Shahpur Division on the afternoon of the 3rd December 1903, consequent on the former's departure on three months' privilege leave.

Pandit Gokal Das will hold charge of the Shahpur Division in addition to the Jhelum Division.

12th December 1903.—No. 562.—A. L. No 22.—Appointment.—Mr. C. G. Trevor, who has been appointed an Assistant Conservator of Forests of the 2nd grade, and posted to the Punjab, reported his arrival at Bombay on the afternoon of the 24th November 1903, and at Lahore on the forenoon of the 28th idem, from which date he has been attached to the Direction Division.

## 7.—CENTRAL PROVINCES GAZETTE.

29th October 1903.—No. 140.—Under the authority conferred by Article 31, Clause (1), of the Forest Department Code, Babu Bishen Dass Madan, a private student of the Imperial Forest School, Dehra Dun, who had duly obtained the Higher Standard Certificate of the School in 1900, is appointed, on probation, as Ranger, 6th grade, with effect from the 31st October 1903, and posted to the Damoh Division, where he will work as Working-plans Inspector.

16th November 1903.—No. 12.—N. C. Chatterji, Forest Ranger, attached to the Chanda Division, was granted one month and fifteen days' privilege leave from the 13th September to the 27th October 1903.

28th November 1903.—No. 5409.—Mr. L. G. Smith, Deputy Conservator of Forests, has been granted, by His Majesty's Secretary of State for India, three months' leave on medical certificate in extension of the leave granted him by Revenue Department Order No. 1782, dated the 29th April 1903.

28th November 1903.—No. 5416.—Mr. A. W. Blunt, Deputy Conservator of Forests, 3rd (officiating 2nd) grade, Chanda Division, was placed in charge of the current duties of the Conservator's Office, Northern Circle, Central Provinces, from the 14th September to the 19th October 1903.

8th December 1903.—No. 5536.—Privilege leave for three months, in combination with leave on urgent private affairs for three months, under Articles 260, 233 and 337 of the Civil Service Regulations, is granted to Mr. Faiz Baksh, Extra-Assistant Conservator of Forests, 4th grade, with effect from the 9th December 1903, or the subsequent date on which he may avail himself of it.

6th December 1903.—No. 93.—Third grade Deputy Ranger Muhammad Abdul Karim, Wun Division, is granted, under Article 336 of the Civil Service Regulations three months' leave on medical certificate, with effect from the 13th November 1903.

12th December 1903.—No. 5683.—The Chief Commissioner is pleased to direct that on the 1st July 1903 the list of Extra-Assistant Conservators stood as follows:—

1st Grade—3 (temporarily 5).

1. Rai Bahadur Mansukh Rai.
2. Mr. S. G. Pranipe, B. A. (Ind.)
3. " N. C. McLeod.
4. " J. J. Hubday, B. A. (Ind.), Temporary appointment.

5. Mr. Ramchandra Krishna, Temporary appointment.  
2nd Grade—2 (*temporarily 5*).  
Mr. R. C. Thompson.
6. " S. Srinivasalu.
7. " L. K. Martin.
8. " W. G. J. Peake.
9. " A. Hunt.
9. " S. R. Parsons, sub. *pro tem*.
10. " Ganga Pershad Khatri, sub. *pro tem*.  
3rd Grade—3
11. Mr. W. G. Gilmore.
12. " A. Ponnuswamy Mudaliar, sub. *pro tem*.
13. " Amrit Lal Chatterji, sub. *pro tem*.  
4th Grade—4.
14. Mr. B. Inamati Sham Rao.
15. " Pandurang Narayan.
16. " Faiz Baksh, sub. *pro tem*.
17. " Dhanji Shah Nasarwanji Avasia, sub. *pro tem*.

14th December 1903.—No. 5704.—Mr. J. Donald, Assistant Conservator of Forests, 2nd grade, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Service, is attached to the Balaghat Forest Division of the Southern Circle, Central Provinces.

Mr. J. Donald reported his arrival at Bombay on the afternoon of the 24th November 1903, and at Nagpur on the forenoon of the 28th November 1903.

14th December 1903.—No. 5712.—Mr. V. G. Morgan, Assistant Conservator of Forests, attached to the Direction Division, Jubbulpore, is transferred to the Mandla Forest Division, for the purpose of preparing a working-plan for the Motinala Forests during the coming open season, 1903-04.

16th December 1903.—No. 5770.—Privilege leave for three months, under Articles 246 and 260 of the Civil Service Regulations, is granted to Mr. A. W. Blunt, Deputy Conservator of Forests, from the forenoon of the 10th December 1903.

#### 8.—BURMA GAZETTE.

19th November 1903.—No. 5.—With reference to Revenue Department Notification No. 395 (Forests), dated the 3rd October 1903, Mr. G. R. Jeffery, Assistant Conservator of Forests, relinquished charge of his duties in the Mu division, on the afternoon of the 9th November 1903, and received charge of the Myadaung sub-division, Katha division, from Mr. J. Messer, Deputy Conservator of Forests, on the afternoon of the 11th November 1903.

19th November 1903.—No. 22.—With reference to Revenue Department Notification No. 394 (Forests), dated 3rd October 1903, Mr. R. E. Marsden, officiating Deputy Conservator of Forests, assumed charge of the North Tharrawaddy sub-division. Tharrawaddy division, on the forenoon of 6th November 1903, relieving Mr. W. R. French, Extra Assistant Conservator of Forests.

25th November 1903.—No. 16.—With reference to Revenue Department Notification No. 432 (Forests), dated the 5th November 1903, Mr. D. H. Allan, Extra-Assistant Conservator of Forests, made over charge of his duties in the Thaungyin division to Mr. H. S. Ker-Edie, Deputy Conservator of Forests, on the afternoon of the 16th November 1903.

25th November 1903.—No. 6.—Mr. H. McL. Carson, Ranger, 2nd grade, relinquished charge of the Myitkyina range, Myitkyina division, and proceeded on privilege leave for one month and two days, combined with furlough for four months and 28 days, with effect from the 20th November 1903.

23rd November 1903.—No. 15.—With reference to Revenue Department Notification No. 422 (Forests), dated the 27th October 1903, Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests, assumed charge of the West Salween division, relieving Mr. A. E. Ross, Deputy Conservator of Forests, on the forenoon of the 12th November 1903.

25th November 1903.—No. 462.—On return from leave Mr. R. L. Pocock, Extra-Assistant Conservator of Forests, is posted to duty in the Yaw Division.

28th November 1903.—No. 463.—The following alterations in rank are ordered in the Forest Department:—

- (1) With effect from the 19th October 1903, consequent on the reversion of Mr. J. Copeland to his substantive appointment of Deputy Conservator, 1st grade:

Mr. G. F. R. Blackwell, Deputy Conservator, 2nd grade, *prov sub.*, officiating 1st grade, to revert to his *prov sub* appointment.

Mr. C. W. A. Bruce, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. R. S. Troup, Deputy Conservator, 4th grade, *prov sub.*, officiating 3rd grade, to revert to his *prov. sub.* appointment.

28th November 1903.—No. 464 (Forests).—This department Notification No. 131 (Forests), dated the 21st May 1898, is hereby cancelled.

30th November 1903.—No 295.—At an examination held at Taunggyi on the 4th November 1903, Mr. M. Hill, Deputy Conservator of Forests, Southern Shan States, passed in Shan by the lower standard.

Mr. Hill is entitled to receive a reward of Rs. 1,000.

4th December 1903.—No 470.—Mr. Stephen Francis Hopwood, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 28th November 1903, before noon.

Mr. Hopwood is posted to the Headquarters of the Pyinmana Forest Division of the Southern Circle.

4th December 1903.—No. 471.—Mr. Francis William Collings who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 28th November 1903, before noon.

Mr. Collings is posted to the Headquarters of the Mu Forest Division of the Northern Circle.

8th December 1903.—No. 25.—With reference to Appointment Department Notification No. 340, dated the 2nd December 1903, Mr. R. A. Gibson, Revision Settlement Officer, relinquished charge of his duties at Kyaukae, on the 13th November 1903, after noon, and assumed charge of his duties at Mandalay, on the 16th November 1903, before noon.

8th December 1903.—No. 26.—With reference to Appointment Department Notification No. 679, dated the 2nd December 1903, Maung Byaung (1), Assistant Settlement Officer, relinquished charge of his duties at Kyaukae on the 16th November 1903, after noon, and assumed charge of his duties at Mandalay on the 18th November 1903, before noon.

9th December 1903.—No. 17.—With reference to Revenue Department Notification No. 432 (Forests), dated the 5th December 1903, Mr. D. H. Allan, Extra-Assistant Conservator of Forests, assumed charge of the duties of Personal Assistant to the Conservator of Forests, Tenasserim Circle, on the forenoon of the 25th November 1903.

## 9.—ASSAM GAZETTE.

23rd November 1903.—No. 10088G.—Mr. W. A. R. Dorat, Deputy Conservator of Forests, in charge of the Goalpara Forests Division, on relief by Mr. W. F. Perree, is attached temporarily to that division.

*4th December 1903.*—No. 104990.—Privilege leave of absence for fifteen days, under Article 260 of the Civil Service Regulations, is granted to Mr. W. A. R. Doxat, Deputy Conservator of Forests, attached to the Goalpara Forest Division, with effect from the date on which he may have availed himself of it.

**10.—MYSORE GAZETTE.**

*23rd November 1903.*—No. 342—3580.—Under Article 188 of the Mysore Service Regulations, Mr. K. Shamiengar, Assistant Conservator of Forests, Chitaldrug District, is granted privilege leave of absence for one week, with effect from the 25th instant or such other date as he may avail himself of the same, the Treasury Assistant Commissioner, Chitaldrug District, being in charge of the District Forest Office during Mr. Shamiengar's absence on leave.

*16th December 1903.*—No. 407—5004.—Under Article 188 of the Mysore Service Regulations, Mr. M. Srinivasa Rao, Sub-Assistant Conservator of Forests, Shimoga District, is granted twenty-two days' privilege leave, from the 1st of December 1903 or from such date as he may wish to avail himself of the same. In continuation of the above, he is also granted five months and eight days' leave on private affairs, under Article 219 of the said Regulations.

## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

23rd December 1903.—No. 1483-F—244-3.—Mr. H. A. Hoghton, Officiating Conservator of Forests, 3rd grade, Central Provinces, is granted privilege leave for one month and 22 days, combined with furlough for 4 months and 8 days, with effect from the 11th December 1903.

The following appointment is made during Mr. Hoghton's absence, or until further orders:—

Mr. C. P. Fisher, Deputy Conservator of Forests, 2nd grade, Punjab, to officiate as Conservator, 3rd grade, with effect from the 17th December 1903, the date on which he took over charge of the Southern Circle, Central Provinces.

29th December 1903.—No. 1488-F.—189-7.—The services of Mr. H. C. Walker, Assistant Conservator of Forests, 2nd (officiating 1st) grade, Burma, are placed temporarily at the disposal of the Superintendent of Port Blair, from the 6th October 1903, for employment in the Andamans Forest Department. Mr. Walker will continue to be borne on the Burma establishment while so employed.

18th January 1904.—No. 36-F.—244-14.—Mr. H. Jackson, Deputy Conservator of Forests, 2nd grade, Burma, is appointed to officiate as Conservator of Forests, 3rd grade, with effect from the 11th December 1903, until further orders, but to remain *seconded* as Deputy Director, Imperial Forest School, Dehra Dun.

### 2.—MADRAS GAZETTE.

19th December 1903.—*Leave*.—A. N. Bhujanga Row, Deputy Ranger, 1st grade, and acting sub-*pro tem*. Ranger, 6th grade, is granted sick leave on medical certificate for two months from date of relief.

19th December 1903.—*Transfers*.—The following transfers are ordered to take effect from date of return of acting Ranger A. N. Bhujanga Row from two months' leave granted in this office service order No. 217 of 1903:—

(1) M. R. Ry. A. N. Bhujanga Row, Deputy Ranger, 1st grade, and acting sub-*pro tem*. Ranger, 6th grade, from Kurnool to Anantapur.

(2) M. R. Ry. K. G. Venkatarama Aiyar, Ranger, 6th grade, and acting 5th grade, sub-*pro tem*., from Bellary to Kurnool.

19th December 1903.—*Reversion*.—M. Srinivasa Row, Forester, 2nd grade, and acting Ranger, 6th grade, Kistna district, will revert to Deputy Ranger, 1st grade, acting sub-*pro tem*., with effect from 1st December 1903.

19th December 1903.—*Appointment*.—H. Rama Row, Deputy Ranger, 3rd grade, and acting Deputy Ranger, 1st grade, Kistna district, is appointed to act as Ranger, 6th grade, sub-*pro tem*., from 1st December 1903, *vice* M. Srinivasa Row reduced.

24th December 1903.—*Leave*.—M. R. Ry. K. Gajaraja Mudaliar, Ranger, IV South Coimbatore division, is granted privilege leave for 20 days from 2nd January 1904 in continuation of Christmas holidays, under Article 260 of the Civil Service Regulations.

29th December, 1903.—*Transfer and Leave*.—(1) Mr. H. J. McLaughlin, Extra Assistant Conservator of Forests, is transferred from Godavari to Bellary district.



(2) M. R. Ry. P. Anantha Row, Ranger, Bellary district, is granted privilege leave for three months and in continuation furlough for six months from the date of relief by No. (1).

*2nd January 1904*—No. 3.—Mr. Claude duPre Thornton, Deputy Conservator of Forests, to be District Forest Officer, South Malabar. To join on return from leave.

*4th January 1904*—No. 2.—Mr. Stephen Cox, Deputy Conservator of Forests, is on return from leave posted to the special work of investigating the question of the feasibility of starting the *Keddah* system of capturing elephants in this Presidency, and will work under the orders of the Conservator of Forests, Southern Circle.

*11th January 1903*—No. 14.—Under Articles 233, 260 and 388 (a) of the Civil Service Regulations, Mr. F. A. Seager, Extra Assistant Conservator of Forests, is granted, with effect from the date of his relief, privilege leave for three months and in continuation thereof furlough for three months.

*11th January 1903*—No. 15.—Mr. H. A. Gass, Conservator of Forests, Madras, has been granted by the Right Honourable the Secretary of State for India an extension of nine months' furlough.

### 3.—BOMBAY GAZETTE.

*5th January 1904*—No. 7687.—Mr. P. E. Aitchison, Assistant Conservator of Forests, has been appointed to do duty in the Southern Division, Kanara, and reported himself to the Divisional Forest Officer, S. D. Kanara, on the afternoon of the 21st December 1903.

*6th January 1904*—No. 64.—His Excellency the Governor in Council is pleased to make the following appointments:—

Mr. W. G. Betham, on return to duty, to be Divisional Forest Officer, Ahmednagar.

Mr. W. F. D. Fisher, on relief, to be Divisional Forest Officer, North Thana.

*12th January 1904*—No. 281.—Mr. Gopal Manjunath Bhatkal, Extra Assistant Conservator of Forests, 4th grade, and Sub-Divisional Forest Officer, East Khandesh, is allowed privilege leave of absence for three months.

*12th January 1904*—No. 282.—His Excellency the Governor in Council is pleased to appoint Mr. Jehangir Hormasji Irani to act as 4th grade Extra Assistant Conservator of Forests, East Khandesh, during the absence on privilege leave of Mr. Gopal Manjunath Bhatkal or pending further orders.

*12th January 1904*—No. 7885.—Mr. Ganpat Ramji Mane, Extra-Assistant Conservator of Forests, who was transferred from the Northern Division of Kanara to the Belgaum Division as Sub-Divisional Forest Officer there, received charge of his duties from Mr. J. H. Irani, acting Extra-Assistant Conservator, on the forenoon of 4th January 1904.

*15th January 1904*—No. 8040.—Mr. H. A. Nadkarni, Extra-Assistant Conservator, who was transferred during his absence on three months' privilege leave from 2nd October 1903 from the Belgaum Division to the Northern Division of Kanara as Sub-Divisional Forest Officer there, received charge of his duties from Mr. G. R. Mane, Extra-Assistant Conservator, on the forenoon of 2nd January 1904.

### 4.—BENGAL GAZETTE.

*13th January 1904*—No. 438G.—With effect from the 3rd December 1903, the date on which Mr. W. F. Perrée, Deputy Conservator of Forests, returned from leave:—

Mr. W. F. Perrée, Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 3rd grade.

Mr. A. R. Dicks, officiating Deputy Conservator of Forests, 3rd grade, to revert to his substantive appointment of Deputy Conservator, 4th grade.

16th January 1904.—No. 348.—Consequent on the departure of Mr. E. P. Stebbing, Deputy Conservator of Forests, 4th grade, on three months' privilege leave, combined with three months' furlough, with effect from the 19th November 1903, Mr. T. H. Monteath, Deputy Conservator of Forests, 4th grade, substantive *pro tem.*, will officiate in that grade from the same date.

19th January 1904.—No. 317A.—The report of the Central Examination Committee having been received, the result of the Second Half-yearly Departmental Examination of Assistant Magistrates and others, held on the 16th November 1903 and the two following days, is published for general information :—

#### IV.—FOREST OFFICERS.

The following officers have passed in the subject or subjects mentioned against them :—

- |                     |     |   |
|---------------------|-----|---|
| 1. Mr. W. F. Lloyd  | ... | Bengali, Higher Standard.                                     |
| 2. „ H. K. Robinson | ... | Hindustani, Higher Standard ; and<br>Procedure and Accounts.* |
| 3. „ W. Breakey     | ... | Forest Law.*  |

#### 5.—UNITED PROVINCES GAZETTE.

5th January 1904.—No. 23-II—86 A-11.—Mr. J. M. Blanchfield, Extra-Assistant Conservator of Forests, 1st grade, officiated as Extra Deputy Conservator of Forests, 4th grade, during the absence of Babu Karuna Nidhan Mukerji, Extra Deputy Conservator of Forests, on privilege leave.

6th January 1904.—No. 52—II-351B.—Lala Har Swarup, Extra-Assistant Conservator of Forests, on return from deputation in Ajmer, to be in charge of the Pilibhit Forest Division of the Oudh Circle.

6th January 1904—No. 51—II-351B.—Saiyid Mahdi Hasan, Extra-Assistant Conservator of Forests, in charge of the Pilibhit Forest Division of the Oudh Circle, on being relieved, to be attached to the Ganges Forest Division of the Central Circle.

18th January 1904—No. 214—II-31C.—Pandit Rama Dat, Extra-Assistant Conservator of Forests attached to the Jaunsar Forest Division of the School Circle, privilege leave for two months, with effect from the 1st February 1904.

#### 6.—PUNJAB GAZETTE.

9th January 1904.—No. 10—A.-L. No. 1.—Mr. C. P. Fisher, Deputy Conservator of Forests, and Mr. A. D. Blascheck, Officiating Deputy Conservator of Forests, respectively made over and received charge of the Chamba Forest Division on the forenoon of the 14th December 1903, consequent on the former's transfer to Southern Circle, Central Provinces, as Officiating Conservator of Forests.

Mr. Blascheck will hold charge of the Chamba Forest Division, in addition to the Direction Division and the duties of Personal Assistant to the Conservator of Forests, Punjab, until further orders.

9th January 1904.—No. 14—A.-L. No. 2.—Messrs. A. D. Blascheck, Officiating Deputy Conservator of Forests, and C. G. Trevor, Assistant Conservator of Forests, respectively made over and received charge of the Direction Division and the duties of Personal Assistant to the Conservator of Forests, Punjab, on the afternoon of the 19th December 1903, consequent on the former's transfer to the Chamba Division.

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\* With credit.

15th January 1904.—No. 28.—A.L. No. 3.—The following changes have taken place in the List of Forest Officers in the Associated Provinces with effect from the date specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Mr. R. Williamson	Provisional Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	15th September 1903.	Consequent on Mr. A.W. Blunt's appointment as Officiating Conservator.
Mr. S. L. Kenny	Officiating Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. R. Williamson	Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 3rd grade.	19th October 1903.	Consequent on Mr. Monro's return from privilege leave.
Mr. S. L. Kenny	Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 4th grade.		

#### 7.—CENTRAL PROVINCES GAZETTE.

8th December 1903.—No. 150.—With the approval of the Hon'ble the Chief Commissioner, Central Provinces, Mr. W. J. Anthony, Forest Ranger, 2nd grade, is reduced for six months to Forest Ranger, 3rd grade, with effect from the 1st December 1903.

13th January 1904.—No. 235.—Mr. B. Inamati Sham Rao, Extra-Assistant Conservator of Forests, Chanda, is transferred to the charge of the Seoni Forest Division.

13th January 1904.—No. 253.—On being relieved by Mr. Inamati Sham Rao, Mr. A. A. Dunbar-Brander, Officiating Deputy Conservator of Forests, is transferred to the Northern Chanda Forest Division.

19th January 1904.—No. 378.—On being relieved by Mr. Dunbar Brander, Mr. L. S. Kenny, Deputy Conservator of Forests, is transferred to the Southern Chanda Forest Division.

19th January 1904.—No. 380.—Mr. L. S. Kenny, Deputy Conservator of Forests, was posted to the Balaghat Forest Division on his transfer from Berar to the Central Provinces.

Mr. Kenny assumed charge of that Division on the afternoon of the 5th September 1903.

#### 8.—BURMA GAZETTE.

12th December 1903.—No. 508.—Under the provisions of Articles 246 and 260 of the Civil Services Regulations, privilege leave for three months is granted to Mr. Hatim Tai, Extra Assistant Conservator of Forests, from the date on which he may avail himself of the leave.

16th December 1903.—No. 26.—With reference to Revenue Department Notification No. 470 (Forests), dated the 4th December 1903, Mr. S. F. Hopwood, Assistant Conservator of Forests, reported himself for duty in the Pyinmana Division on the forenoon of 2nd December 1903.

18th December 1903.—No. 8.—Mr. C. A. Clerk, Ranger, 2nd grade, relinquished charge of the Mawku and Yu Ranges, Upper Chindwin

Division and proceeded on privilege leave for one month and twenty-two days, combined with leave on medical certificate for four months and eight days, with effect from the forenoon of the 12th November 1903.

18th December 1903.—No. 9.—Mr. McL. Carson, Ranger, 2nd grade, relinquished charge of the Myitkyina Range, Myitkyina Division, and proceeded on privilege leave for one month and five days combined with leave on medical certificate for four months and twenty-five days, with effect from the 20th November 1903.

This cancels Notification No. 6, published in Part IV of *Burma Gazette*, dated the 5th December 1903.

21st December 1903.—No. 23.—Maung Po Ta, Forest Ranger, 2nd grade, is transferred from the Bassein Range to the charge of the Wakema Sub-Division of the Bassein-Myaungmya Division.

23rd December 1903.—No. 24.—Mr. C. C. Chill, Forest Ranger, 3rd grade, on transfer from the Wakema Sub-Division of the Bassein-Myaungmya Division, assumed charge of the Railway-Range, Rangoon Division, on the forenoon of the 17th December 1903.

29th January 1903.—No. 525.—On his return from deputation to the Federated Malay States, Mr. W. H. Craddock, Extra Assistant Conservator of Forests, is posted to the Ataran Forest Division.

4th January 1904.—No. 1.—Under the provisions of Articles 246, 260 and 345 of the Civil Service Regulations, Maung Yaing, K. S. M., Extra Assistant Conservator of Forests, is granted privilege leave for one month and twenty-four days with effect from the date on which he availed himself of it.

4th January 1904.—No. 1.—Mr. H. P. Tarleton, Inspector, availed himself of the leave granted him in this office Notification No. 654, dated the 25th November 1903, on the forenoon of the 4th December 1903.

6th January 1904.—No. 4.—Under the provisions of Articles 233, 260 and 336 of the Civil Service Regulations, Mr. W. H. Craddock, Extra Assistant Conservator of Forests, is granted privilege leave for one month and fifteen days and leave on medical certificate in continuation thereof for four months and fifteen days with effect from the date on which he availed himself of the privilege leave.

12th January 1904.—No. 29.—The following promotions are ordered in the Subordinate Forest Service :

Maung Tun, Ranger, 4th grade, to be Ranger, 3rd grade, with effect from the 27th July 1903.

Maung Nyo Dun, Ranger, 4th grade, to be Ranger, 3rd grade, with effect from the 21st August 1903.

14th January 1904.—No. 33 (Forests).—On the expiry of the leave granted to Mr. J. W. Ryan, Extra-Assistant Conservator of Forests, in this Department Notification No. 354, dated the 3rd September 1903, Mr. Ryan was placed on special duty from the 16th November to the 15th December inclusive, in connection with the recruitment in Southern India of coolies for the Mergui Rubber Plantation.

20th January 1904.—No. 22.—Mr. G. K. Parker, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

#### 9.—ASSAM GAZETTE.

30th December 1903.—No. 11058G.—In consequence of the deputation to Ceylon of Mr. J. L. Pigot, Deputy Conservator of Forests, 1st grade the following promotions are made, with effect from the 12th January 1903

in supersession of those ordered in Notification No. 2722G, dated the 31st March 1903 :—

Mr. D. P. Copeland, Deputy Conservator of Forests, 2nd grade, to be Deputy Conservator of Forests, 1st grade, sub. *pro tem*.

Mr. H. G. Young, Deputy Conservator of Forests, 3rd grade, to be Deputy Conservator of Forests, 2nd grade, sub. *pro tem*.

Mr. J. E. Barrett, Deputy Conservator of Forests, 4th grade, on leave, to be Deputy Conservator of Forests, 3rd grade, sub. *pro tem*.

Mr. A. R. Dicks, Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 3rd grade.

Mr. W. A. R. Doxat, Officiating Deputy Conservator of Forests, 4th grade, to be sub. *pro tem* in that grade.

31st December 1903.—No. 11149G.—With effect from the 27th October 1903. Mr. E. M. Coventry, Deputy Conservator of Forests, 4th grade, is appointed to be Deputy Conservator of Forests, 3rd grade, sub. *pro tem*.

31st December 1903.—No. 11141G.—Mr. E. M. Coventry, Deputy Conservator of Forests, is granted privilege leave of absence for three months, combined with furlough for nine months, under Articles 233 and 308 (b) of the Civil Service Regulations, with effect from the 27th October 1903.

5th January 1904.—No. 356G.—On the report of the Central Examination Committee, the Chief Commissioner directs the publication for general information, of the results of the Half-yearly Examination of Assistant Commissioners, Extra-Assistant Commissioners, and other officers, held on the 9th, 10th, 11th, 12th and 13th November 1903 :—

Name.	SUBJECT TAKEN UP BY CANDIDATES.		SUBJECTS IN WHICH PASSED		SUBJECTS IN WHICH STILL REQUIRED TO PASS	
	Higher standard.	Lower standard.	Higher standard.	Lower standard.	Higher standard.	Lower standard.
1	2	3	4	5	6	7
<i>Forest Officer</i>						
Mr. G. M. Townshend, Assistant Conservator of Forests.	Assamese	Assamese	.....	Assamese	Assamese	.....
	Land Revenue, Forest Law, Procedure and Accounts		Land Revenue.		Forest Law, Procedure and Accounts	

#### 10.—MYSORE GAZETTE.

5th January 1904.—No. 442-5438.—Under Article 188 of the Mysore Service Regulations, Mr. M. G. Rama Rao, Assistant Conservator of Forests, and District Forest Officer, Kadur District, is granted privilege leave of absence for 45 days with effect from the 4th January 1904 or such other date as he may avail himself of the same.

Mr. H. Ramiah, Sub-Assistant Conservator of Forests, will be in charge of the District Forest Office, Kadur, during the absence of Mr. Rama Rao on leave or until further orders.

5th January 1904.—No. 448-5466.—Under Article 188 of the Mysore Service Regulations, Mr. S. A. Bapu Rao, Deputy Conservator of Forests, Kolar District, is granted privilege leave of absence for 1 month and 15 days, with effect from the 15th December 1903.

Mr H. Srinivasa Rao, Assistant Conservator of Forests, Heggaddevankote Range, Mysore District, is temporarily transferred to Kolar for the Forest charge of the district.

*5th January 1904.*—No. 452—5470 Mr G. E. Rickets, Headquarter Assistant to the Conservator of Forests and Assistant Secretary to Government, Forest Department, is appointed Deputy Conservator of Forests, 3rd grade, and placed in charge of Game Preserves, with effect from 2nd December 1903.

*20th January 1904.*—No. 466—5885.—Under Article 188 of the Mysore Service Regulations, Mr. H. Srinivasa Rao, Assistant, Conservator of Forests, in temporary charge of the District Forest Office, Kolar, is granted privilege leave of absence for 1 month, with effect from the 28th January 1904 or such other date as he may avail himself of the same. The Treasury Assistant Commissioner, Kolar, will be in charge of the District Forest Office till the return of Mr. Bapu Rao from leave or until further orders.

*20th January 1904.*—No. 470—5889.—Under Article 188 of the Mysore Service Regulations, Mr. H. Ramaiya, Sub-Assistant Conservator of Forests, in charge Kadar District Forest Office, is granted privilege leave of absence for 12 days, with effect from the 30th January 1904 or such other date as he may avail himself of the same, the Treasury Assistant Commissioner, Chikmagalur, being in charge of the District Forest Office during Mr. Ramaiya's absence or until further orders.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

27th January 1904.—No. 84—244-15-F—*Addendum*. In paragraph 1 of the Notification of this Department, No. 1843-F., dated the 23rd December 1903, granting leave to Mr. H. A. Houghton, Officiating Conservator of Forests, 3rd grade, Central Provinces, *add* the word “on medical certificate” after the words “8 days.”

10th February 1904.—No. 195—40-3 F.—On return from furlough Mr. C. M. Hodgson, Deputy Conservator of Forests, 3rd grade, Burma, is transferred to the Madras Presidency in the interests of the public service.

### 2.—MADRAS GAZETTE.

13th January 1904.—Transfer.—In modification of this Office Service Order No. 218 of 1903, dated 19th December 1903, A. N. Bhujanga Row, Deputy Ranger, 1st grade, and acting sub. *pro tem*. Ranger 6th grade, is transferred to Bellary. To join on expiry of leave.

16th January 1904.—No. 29.—M. R. Ry. Thummaji Rao Bapu Rao Avargal, Extra-Assistant Conservator of Forests, 3rd grade, to be Extra-Assistant Conservator of Forests, 2nd grade.

20th January 1904.—Confirmation of appointment.—M. R. Ry. V. S. Subramanyam, probationary Ranger, 6th grade, Ganjam district, is confirmed with effect from 31st March 1903.

28th January 1904.—No. 48.—Under article 260 of the Civil Service Regulations Mr. F. A. Lodge, Deputy Conservator of Forests, is granted privilege leave for three months with effect from or after the 10th March 1904.

28th January 1904.—Reversion.—L. Hanumanthulu, Ranger, 2nd grade and acting 1st grade, Ganjam district is reverted to the 2nd grade, from 21st October 1903, and reduced to one place (*i.e.*, to below Mr. Thompson).

31st January 1904.—Leave.—M. R. Ry. K. G. Venkatrama Iyer, Ranger, Bellary district, is granted leave on medical certificate for nineteen days from 20th November 1903.

31st January 1904.—Departmental Test.—The following are declared to have passed the Forest Departmental Test in both branches, *viz.*, (a) Forest Act and Rules and (b) Forest Code and Accounts :—

M. Krishnamurthi, Deputy Ranger, Bellary.

K. Thatha Chari, Deputy Ranger, Kurnool.

T. V. Narasimha Row, Deputy Ranger, Ganjam.

D. Kasi Viswanath, Fourth Clerk, District Forest Office, Ganjam.

9th February 1904.—*Ettatum*.—In this Office Service Order No. 207 of 1903, dated 1st December 1903, confirming B. Sanniah as Ranger, 6th grade, read “12th May 1903” for “31st March 1903.”

11th February 1904.—Extension of Leave.—The three months' privilege leave from 16th November 1903, granted in this office S. O. No. 186 of 12th November 1903, to Mr. A. G. Van Haeften, Ranger, I, South Malabar division, is extended by three months' leave on medical certificate under article 233 of the Civil Service Regulations.

11th February 1904.—No. 64.—Mr. Francis Cowley Loftus Cowley-Brown, Deputy Conservator of Forests, will, on completing the preparation of working-plans for the Surada and Buguda ranges in the Ganjam district, proceed to Kurnool for the preparation of working-plans for the Nallamalai forests.

*Note*.—This modifies Notification No. 361 published at page 1036, Part I, of the Fort St. George Gazette, dated 15th September 1903.



12th February 1904.—No. 65.—Mr. Arthur Bushe Jackson, Deputy Conservator of Forests, to be District Forest Officer, the Nilgiris, with effect from the date on which Mr. G. Hadfield retires from the service.

12th February 1904.—No. 66.—M. R. Ry. Thummaji Rao Bapu Rao Avargal, Extra-Assistant Conservator of Forests, to act as District Forest Officer, South Salem, during the absence of Mr. F. A. Lodge on privilege leave or until further orders.

12th February 1904.—No. 67.—The following appointments and reversions are made :—

With effect from the date on which Mr. G. F. F. Foulkes returned to duty.

- (1) Mr. Cecil Ernest Claude Fischer, to revert as Deputy Conservator of Forests, 4th grade.
- (2) Mr. Hugo Francis Andrew Wood, to act as Deputy Conservator of Forests, 3rd grade, during the absence of Mr. H. A. Gass, on furlough.
- (3) Mr. Bernard Henry Barlow Poole, to act as Deputy Conservator of Forests, 4th grade, during the absence of Mr. H. J. A. Porter on furlough.

With effect from the date on which Mr. C. M. Hodgson joined duty in this Presidency

- (4) Mr. Henry Tireman, to revert as Deputy Conservator of Forests, 4th grade.

With effect from the date on which Mr. C. D. P. Thornton returned to duty.

- (5) Mr. Hugo Francis Andrew Wood, to revert as Deputy Conservator of Forests, 4th grade.
- (6) Mr. Francis Cowley Loftus Cowley-Brown, to act as Deputy, Conservator of Forests, 3rd grade, during the absence of Mr. H. A. Gass on furlough or until further orders.
- (7) Mr. James Stewart Scot, to act as Deputy Conservator of Forests, 4th grade, until the date of the expiry of his privilege leave, during the absence of Mr. S. Cox on furlough.
- (8) Mr. William Aitchison, to act as Assistant Conservator of Forests, 1st grade, *vice* Mr. C. B. Dawson acting as Deputy Conservator of Forests, 4th grade, but to act as Deputy Conservator of Forests, 4th grade, from the date of expiry of Mr. Scot's privilege leave until the return of Mr. S. Cox to duty.

With effect from 4th January 1904, the date on which he passed the Third Class Vernacular Test.

- (9) Mr. Robert Daniel Richmond, to act as Assistant Conservator of Forests, 1st grade, *vice* Mr. J. L. Mac C. O'Leary on furlough or until further orders.

12th February 1904.—Extension of Leave.—The twenty days' privilege leave granted to K. Gajaraja Mudaliar, Forest Ranger, 4th grad, (vide *Port St. George Gazette*, dated 5th January 1904, Part II, page 2), is extended by one month and two days.

23rd February 1904.—No. 70.—Under article 260 of the Civil Service Regulations, Mr. A. W. Lushington, Acting Conservator of Forests, Northern Circle, is granted privilege leave for three months with effect from 'at March 1904 or date of relief.

No. 75.—Mr. Claude duPré Thornton, to be District Forest Officer, South Coimbatore. To join at once.

No. 76.—Mr. Henry Tireman, to be District Forest Officer, South Malabar, without prejudice to his duties as District Officer, North Malabar.

### 3.—BOMBAY GAZETTE.

21st January 1904.—No. 2557.—Mr. G. M. Ryan, acting Deputy Conservator of Forests, 2nd grade, delivered over, and Mr. A. C. Robinson, Extra-Assistant Conservator of Forests, 1st grade, received charge of the

office of the Divisional Forest Officer, North Thana, on the 13th January 1904, in the forenoon.

No. 3183.—Messrs. G. M. Bhatkal, Extra-Assistant Conservator of Forests, 4th grade, and J. D. Maitland-Kirwan, Assistant Conservator of Forests, 2nd grade, respectively delivered over and received charge of the Sub-division Forest Office, East Khandesh, on the 11th January 1904, in the afternoon.

26th January 1904.—No. 3217.—Messrs. A. C. Robinson, Extra-Assistant Conservator of Forests, and L. S. Osmaston, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, West Khandesh, on the afternoon of the 9th January 1904.

27th January 1904.—No. 3232.—Messrs. J. D. Maitland-Kirwan Assistant Conservator of Forests, 2nd grade, and J. H. Irani, Ranger, 1st grade, respectively delivered over and received charge of the Sub-division Forest Office, East Khandesh, on the forenoon of the 18th January 1904.

27th January 1904 No. 656.—His Excellency the Governor in Council is pleased to cancel Government Notification No. 8699, dated the 9th December 1903, appointing Mr. Chunilal Gulabchand Dalia, L. C. E., to be Extra-Assistant Conservator of Forests, Sind Circle, and to make the following appointments:—

Mr. A. C. Robinson, L.C.E., to act as Divisional Forest Officer, Bijapur.

Mr. Balvant Ganesh Deshpande, on relief, to be Extra-Assistant Conservator of Forests, Sind Circle, and to do duty as Divisional Forest Officer, Naushahre, *vice* Mr. Bajibhai Jadhavbhai Patel, L. C. E.

3rd February 1904.—No. 2675.—Mr. A. C. Robinson, Extra-Assistant Conservator of Forests, 1st grade, delivered over, and Mr. W. F. D. Fisher, Deputy Conservator of Forests, 3rd grade, received charge of the office of the Divisional Forest Officer, North Thana, on the 26th of January 1904, in the afternoon.

3rd February 1904—No. 3307.—Messrs. W. F. D. Fisher, Deputy Conservator of Forests, 2nd grade, and W. G. Betham, Deputy Conservator of Forests, 1st. grade, respectively delivered over and received charge of the Divisional Forest Office, Ahmednagar, on the afternoon of the 25th January 1904.

#### 4.—BENGAL GAZETTE.

9th February 1904.—No. 904 For.—Mr. H. King Robinson, Assistant Conservator of Forests, 2nd grade, is promoted to officiate as Deputy Conservator of Forests, 4th grade, from the 16th November 1903 to the 15th December 1903, and as Assistant Conservator of Forests, 1st grade, from the 16th December 1903 till further orders.

3rd February 1904.—No. 767 For.—Mr. Lalit Mohan Sen, Extra-Assistant Conservator of Forests, 3rd grade, *sub. pro. tem.* in charge of the Tendu Range of Jalpaiguri Division is transferred as an attached officer to the Chittagong Division.

29th February 1904.—No. 1276 For.—Mr. P. J. Draper, Extra-Assistant Conservator of Forests, in charge of the Puri Forest Division is granted privilege leave for three months, under articles 246 and 260 of the Civil Service Regulations, with effect the 13th from April 1904, or from such subsequent date as he may avail himself of it.

Mr. T. H. Monteath, Officiating Deputy Conservator of Forests, in charge of the Tista Forest Division, is transferred to the charge of the Puri Forest Division.

Mr. H. H. Haines, F.C.H., Deputy Conservator of Forests, in charge of the Singhbhum Working Plan, is transferred to the charge of the Tista Forest Division.

29th February 1904.—No. 1277 For.—Mr. E. E. Slane, Extra-Assistant-Conservator of Forests, attached to the Sundarban Division, is granted

furlough for two years, under article 338 (b) of the Civil Service Regulations, with effect from the 6th March 1904, or from such subsequent date as he may avail himself of it.

29th February 1904.—No. 1278 For.—Mr. W. F. Lloyd, Deputy Conservator of Forests, in charge, Sunderbans Forest Division, is granted combined leave for seven months and four days, viz., privilege leave for two months and four days, under article 233 of the Civil Service Regulations, and furlough for the remaining period, under article 308 (b) of the Regulations, with effect from the 28th March 1904, or from such subsequent date as he may avail himself of it.

#### 5.—UNITED PROVINCES GAZETTE.

2nd February 1904.—No. 388.—II-720C.—Mr. R. St. G. Burke, Assistant Conservator of Forests, on return from leave, to the charge of the Gorakhpur Forest Division of the Oudh Circle.

2nd February 1904.—No. 387.—II-720C.—Mr. H. G. Billson, Deputy Conservator of Forests, in charge of the Gorakhpur Forest Division of the Oudh Circle, furlough combined with such privilege leave as may be due to him for a total period of nine months from 10th March 1904.

4th February 1904.—No. 448.—II-223D-2.—Mr. E. A. Courthope, Assistant Conservator of Forests, attached to the Garhwal Forest Division of the Central Circle, to be in charge of that Division, vice Mr. F. A. Leete, transferred.

17th February 1904.—No. 588.—II-622B-1. The undermentioned Officer has been granted by His Majesty's Secretary of State for India permission to return to duty:—

| Name.                | Service.   | Appointment.                   | Date on which permitted to return. |
|----------------------|------------|--------------------------------|------------------------------------|
| Mr. R. C. Milward... | Forest ... | Deputy Conservator of Forests. | Within the period of leave.        |

22nd February 1904.—No. 654.—II-866C.—Mr. R. C. Milward, Deputy Conservator of Forests, on return from leave, to the charge of the Ganges Forest Division of the Central Circle.

22nd February 1904.—No. 655.—II-866C.—Mr. W. H. Lovegrove, Deputy Conservator of Forests, on being relieved from the charge of the Ganges Forest Division of the Central Circle to that of the Garhwal Forest Division of the same Circle.

22nd February 1904.—No. 656.—II-866C.—Mr. E. A. Courthope Assistant Conservator of Forests, in charge of the Garhwal Forest Division of the Central Circle, on being relieved, to be attached to the Janusar Division, School Circle.

#### 6.—PUNJAB GAZETTE.

25th February 1904.—No. 40.—A-L. No. 4.—Messrs. A. J. Gibson and J. C. Carroll, Officiating Deputy Conservators of Forests, respectively made over and received charge of the Kulu Forest Division on the afternoon of the 11th January 1904, on which date the latter returned from 2 months and 21 days and the former proceeded on three months' privilege leave.

The unutilized portion of leave granted to Mr. Carroll is hereby cancelled.

10th February 1894.—No. 61.—Powers.—The Hon'ble the Lieutenant-Governor is pleased to invest Pandit Gokal Das, Extra-Assistant Conservator of Forests, while holding charge of the Jhelum Forest Division, with

the powers defined in Section 71 (d) of Act VII of 1878 (The Indian Forest Act), to be exercised within the limits of the Jhelum Forest Division.

29th February 1904.—No. 104.—A.-L. No. 5.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

| Name.                | Present grade                              | Grade to which promoted or reverted   | With effect from    | REMARKS.   |
|----------------------|--|---|---------------------|--|
| Mr. J. B. Barrett... | Provisional Deputy Conservator, 3rd grade. | Deputy Conservator, 3rd, and Officiating Deputy Conservator, 2nd grade.                   | 27th October 1903.  | Consequent on Mr. E. M. Coventry's departure on transfer to Assam. From the same date Mr. Barrett is confirmed in the 3rd grade. |
| Mr. J. E. Barrett .. | Officiating Deputy Conservator, 2nd grade. | Deputy Conservator, 3rd grade.  | 30th November 1903. | Consequent on Mr. A. W. Blunt's reversion from Officiating Conservator to Officiating Deputy Conservator, 2nd grade.             |
| Mr. C. M. McCrie.    | Officiating Deputy Conservator, 3rd grade. | Provisional Deputy Conservator, 4th grade.  |                     |  |
| Mr. J. E. Barrett... | Deputy Conservator, 3rd grade.             | Officiating Deputy Conservator, 2nd grade.  | 10th December 1903. | Consequent on Mr. A. W. Blunt's proceeding on three months' privilege leave.   |
| Mr. C. M. McCrie.    | Provisional Deputy Conservator, 4th grade. | Provisional Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade. |                     |  |
| Mr. R. Williamsen    | Provisional Deputy Conservator, 3rd grade. | Provisional Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade. | 14th December 1903. | Consequent on Mr. C. F. Fisher's appointment as Officiating Conservator, Southern Circle, Central Provinces.                     |
| Mr. S. L. Kenny...   | Officiating Deputy Conservator, 4th grade  | Officiating Deputy Conservator, 3rd grade.  |                     |  |

#### 7.—CENTRAL PROVINCES GAZETTE.

11th November 1903.—No. 83.—The following promotions among Rangers in Berar are ordered with effect from the 1st November 1903 :—

| Name.                     | Present grade. | Grade to which promoted. |
|---------------------------|----------------|--------------------------|
| M. Narasingha Rao ...     | 2nd            | 1st                      |
| N. S. Dhamdhare ...       | 4th            | 2nd                      |
| Totaram Jankiram ...      | 4th            | 3rd                      |
| Ganesh Keshao Ambekar ... | 5th            | 4th                      |
| Lakshman Balwant Koti ... | 6th            | 5th                      |
| Kripa Singh ...           | 6th            | 5th                      |

24th January 1904.—No. 115.—The leave on medical certificate granted to Deputy Ranger Bhag Ram by Departmental Order No. 75, dated the

29th October 1903. is hereby extended by two months and two days up to the 18th January 1904.

26th January 1904.—No. 116.—The two months' privilege leave on full pay granted to Deputy Ranger Lad Khan, Buldana Division, by Departmental Order No. 82, dated the 9th November 1903, is extended by one month.

26th January 1904.—No. 553.—Mr. H. E. Bartlett, Deputy Conservator of Forests, Nagpur Wardha Division, was placed in charge of the Direction Division, Southern Circle, Central Provinces, from the 11th to the 16th December 1903 inclusive, in addition to his own duties.

30th January 1904.—No. 653.—On return from privilege leave granted him by Order No. 5048, dated the 10th November 1903, Mr. S. R. Parsons, Extra-Assistant Conservator of Forests, Mimar Division, is re-posted to that Division.

February 1904.—No. 654.—On being relieved by Mr. S. R. Parsons, Mr. A. L. Chatterji, Extra-Assistant Conservator of Forests, is transferred to the charge of the Narsinghpur Forest Division.

February 1904.—No. 655.—On being relieved by Mr. A. L. Chatterji, Mr. P. Shankarnath, Ranger, is transferred to the Hoshangabad Division, to hold charge of a Range.

11th February 1904.—No. 860.—Privilege leave for six weeks, under Articles 246 and 280 of the Civil Service Regulations, is granted to Mr. Dhanji Shah Nasarwanji Avasia, Extra-Assistant Conservator of Forests, Chanda, with effect from the 5th February 1904.

12th February 1904.—No. 885.—Mr. C. O. Hanson, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India extraordinary leave without pay to 31st January 1905, in extension of the leave granted him by Revenue Department Order No. 4833, dated the 24th October 1903.

20th February 1904.—No. 128.—The three months' leave on medical certificate, granted to Deputy Ranger Mohammad Abdul Karim, Wun Division, by Forest Order No. 93, dated the 6th December 1903, is extended by two months.

#### 8.—BURMA GAZETTE.

14th January 1904.—No. 1.—With reference to Revenue Department Notification No. 525 (Forests), dated the 29th December 1903, Mr. W. H. Craddock, Extra-Assistant Conservator of Forests, reported himself for duty in the Ataran Division, Moulmein, on the forenoon of the 9th December 1903.

14th January 1904.—No. 2.—With reference to Revenue Department Notification No. 4 (Forests), dated the 6th January 1904, Mr. W. H. Craddock, Extra-Assistant Conservator of Forests, made over charge of his duties in the Ataran Division and availed himself of the one month and fifteen days' privilege leave and four months' and fifteen days' leave on medical certificate on the afternoon of the 21st December 1903.

15th January 1904.—No. 1.—With reference to Revenue Department Notification No. 598 (Forests), dated the 12th December 1903, Mr. Hatim Tai, Extra-Assistant Conservator of Forests, second Instructor, Burma Forest School, Tharrawaddy, made over charge of his duties to Maung Tun Tha, Ranger, 3rd grade, and availed himself of the three months' privilege leave granted to him on the forenoon of the 2nd January 1904.

21st January 1904.—No. 2.—With reference to Revenue Department Notifications Nos. 500, 501, 502 and 503 (Forests), dated the 10th December 1903, Mr. D. Shearme, B. A., I.C.S., Assistant Commissioner, assumed charge of his Forest Settlement duties in the Mandalay Forest Division on the forenoon of the 2nd January 1904.

21st January 1904.—No. 3.—Mr. A. Lawrence, Deputy Conservator of Forests, assumed charge of his special duty in the Yaw Division on the forenoon of the 26th December 1903.

21st January 1904.—No 3.—With reference to Revenue Department Notification No. 33 (Forests), Mr. J W Ryan, Extra-Assistant Conservator of Forests, reported his return from the special duty on which he was placed, and took over charge of the Mergui Rubber Plantation from Mr. D. A. Allan, Ranger, on the afternoon of the 15th December 1903.

21st January 1904.—No. 50.—The following promotions are ordered in the Forest Department :—

With effect from the 13th October 1903, consequent on the confirmation of Mr. H. Slade, Deputy Conservator, 1st grade, as Conservator :

Mr. H. B. Anthony, Deputy Conservator, 2nd (officiating 1st) grade, to be Deputy Conservator, 1st grade.

Mr. G. F. R. Blackwell, Deputy Conservator, 2nd grade, *prov. sub.* (officiating 1st grade), to be confirmed in his appointment and to continue to officiate as Deputy Conservator, 1st grade.

Mr. M. Hill, Deputy Conservator, 3rd (officiating 2nd) grade, to be Deputy Conservator, 2nd grade. *prov. sub.*

Mr. C. M. Hodgson, Deputy Conservator, 3rd grade, *prov. sub.*, to be confirmed in his appointment.

Mr. H. S. Ker-Edie, Deputy Conservator, 4th grade, to be Deputy Conservator, 3rd grade, *prov. sub.*

Mr. A. E. Ross, Deputy Conservator, 4th grade, *prov. sub.* (officiating 3rd grade), to be confirmed in his appointment and to continue to officiate as Deputy Conservator, 3rd grade.

Mr. F. H. Todd, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, *prov. sub.*

Mr. J. J. Rorie, Assistant Conservator, 1st grade, *prov. sub.* (officiating Deputy Conservator, 4th grade), to be confirmed in his appointment and to continue to officiate as Deputy Conservator, 4th grade.

Mr. H. C. Walker, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to be Assistant Conservator, 1st grade, *prov. sub.*, and to continue to officiate as Deputy Conservator, 4th grade.

Mr. L. C. Davis, Assistant Conservator, 2nd grade, *prov. sub.* (officiating Deputy Conservator, 4th grade), to be confirmed in his appointment and to continue to officiate as Deputy Conservator, 4th grade.

21st February 1904.—No 51.—The following alterations in rank are ordered in the Forest Department :—

With effect from the 19th October 1903, consequent on the reversion of Mr. J. Copeland to his substantive appointment of Deputy Conservator, 1st grade :—

Mr. G. F. R. Blackwell, Deputy Conservator, 2nd (officiating 1st) grade, to revert to his substantive appointment.

Mr. C. W. A. Bruce, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. R. S. Troup, Deputy Conservator, 4th grade, *prov. sub.* (officiating Deputy Conservator, 3rd grade), to revert to his *prov. sub.* appointment.

This department Notification No. 463 (Forests), dated the 26th November 1903, is cancelled.

No. 52.—The following alterations in rank are ordered in the Forest Department :—

(1) With effect from the 13th October 1903 :

Mr. E. M. Buchanan, Extra Deputy Conservator, 3rd grade, to be Extra Deputy Conservator, 2nd grade.

(2) With effect from the 2nd December 1903, consequent on the return from deputation of Mr. W. H. Craddock, Extra-Assistant Conservator, 1st grade :

Mr. C. E. Allen, Extra-Assistant Conservator, 1st grade, *prov. sub.*, to be Extra-Assistant Conservator, 2nd grade.

Mr. S. A. Wood, Extra-Assistant Conservator, 2nd grade, *prov. sub.*, to be Extra Assistant Conservator, 3rd grade.

Mr. B. P. Kelly, Extra-Assistant Conservator, 3rd grade, *prov. sub.*, to be Extra Assistant Conservator, 4th grade.

No. 53.—(CARRIAGE) In this department Notification No. 509, dated the 12th December 1903, make the following corrections:—

In column 2 of Specification of land for "Myittha" substitute "Kyaukse."

In line 2, last paragraph of Notification, for "Myittha" substitute "Kyaukse."

29th January 1904.—No. 64.—On his return from deputation in Siam Mr. S. A. Wood, Extra-Assistant Conservator of Forests, was placed on special duty in Rangoon from the 14th March 1902 to the 26th March 1902, inclusive.

6th February 1904.—No. 2 (CORRIGENDUM).—In this office Notification No. 1, dated the 15th January 1904, for "2nd January 1904" read "20th December 1903."

6th February 1904.—No. 4.—With reference to Revenue Department Notification No. 1 (Forests), dated the 4th January 1904, Maung Yaing, K. S. M., Extra-Assistant Conservator of Forests, availed himself of the one month and 24 days' privilege leave on the forenoon of the 1st November 1903, and returned to duty on the forenoon of the 25th December 1903.

9th February 1904.—No. 4.—Mr. Hill, Deputy Conservator of Forests, made over charge of the Southern Shan States Forest Division to Mr. A. G. H. Breithaupt, Extra-Assistant Commissioner, on the afternoon of 1st February 1904.

#### 9.—ASSAM GAZETTE.

29th January 1904.—No. 1121G.—Mr. W. A. R. Doxat, Deputy Conservator of Forests, on return from privilege leave, was attached temporarily to the Goalpara Forest Division.

This cancels Notification No. 10088G., dated the 23rd November 1903.

29th January 1904.—No. 1122G.—Mr. W. A. R. Doxat, Deputy Conservator of Forests, attached to the Goalpara Forest Division, is transferred to the Sibsagar Forest Division, with effect from the 23rd December 1903, for special duty in the Nambor Forest, with head-quarters at Golagath.

#### 10.—MYSORE GAZETTE.

16th February 1904.—No. 536—6681.—Mr. T. E. M. Claudius, retired Extra Deputy Superintendent of the Survey of India, is appointed Superintendent of Forest Surveys in Mysore, for a term of three years, with effect from 20th February 1904.

## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

20th February 1904.—No. 258-F.—80-3.—Mr. J. A. McKee, Conservator of Forests, 1st grade, United Provinces, is permitted to retire from the service of Government, with effect from the 9th December 1903.

From the same date the following promotions are made:—

- (1) Mr. F. B. Manson, Conservator of Forests, 2nd (officiating 1st) grade, Lower Burma, is confirmed in the latter grade.
- (2) Mr. J. H. Lace, Conservator of Forests, 3rd grade, Bengal, to be Conservator, 2nd grade.
- (3) Mr. A. L. McIntire, Officiating Conservator, 3rd grade, Bengal, is confirmed in that grade, and is appointed to officiate in the 2nd grade until further orders.

25th February 1904.—No. 278-F.—56 3.—Mr. M. Hill, Deputy Conservator, 2nd grade, *prov. sub.*, Burma, is appointed to be Assistant Inspector-General of Forests and Superintendent of Working Plots, with effect from the 25th February 1904.

11th March 1904.—No. 338—60-32-F.—Mr. F. A. Leete, F.C.H., Deputy Conservator of Forests, 2nd grade, United Provinces, is transferred to Burma in the interests of the public service.

### 2.—MADRAS GAZETTE.

22nd February 1904.—The following candidates are declared to have passed the Departmental Test Examination held on the 7th January 1904 under section 69 of the Forest Code in the subjects noted against each:—

- (1) S. Doraiswami Aiyar, Forester, South Arcot—(a) and (b).
- (2) Kamakshia, Forester, North Salem—(a) and (b).
- (3) C. Narasinga Pillai, Forester, Chingleput—(b).
- (4) L. Govindaswami Pillai, Forester, Chingleput—(b).
- (5) T. K. Ramaswami Aiyar, Probationary Forester, Chingleput—(b).

23d February 1904.—Mr. A.G., Van Haeften, Ranger, 1st grade, *sub. pro. tem.*, is transferred from South Malabar to the Nilgiris. To join on return from leave.

27th February 1904.—Ranger IV K. Syed Edulla Sahib is transferred from North Coimbatore to Madura on relief by Ranger M. S. Noronha from Dehra Dun.

Ranger II V. P. Ramalingam Pillai is transferred from Madura to Tinnevely on relief by Ranger Syed Edulla Sahib from North Coimbatore Division.

29th February 1904.—No. 82.—Mr. Frank Adrian Lodge to act as Conservator of Forests, 3rd grade, and to be in charge of the Northern Circle during the absence of Mr. A. W. Lushington on privilege leave, or until further orders.

29th February 1904.—No. 83.—M. R. Ry. Thummaji Rao Babu Rao Avargal, Extra Assistant Conservator of Forests, to act as District Forest Officer, South Salem, during the employment of Mr. F. A. Lodge on other duty, or until further orders.

*Note.*—This supersedes Notification No. 66, published at page 194 of Part I of the Fort St. George Gazette, dated 16th February 1904.

29th February 1904.—No. 84.—It is hereby notified that the services of Anumula Venkata Subbarayudu, permanent Deputy Ranger, Forest Department, in the Godavari district, have been dispensed with.



**5th March 1904.**—No. 89.—Under article 260 of the Civil Service Regulations, Mr. Henry FitzGerald Arbuthnot, Deputy Conservator of Forests, is granted privilege leave for three months with effect from the 29th March 1904, or date of relief.

**8th March 1904.**—*Leave.*—Mr. E. M. Crothers, Ranger, 6th grade, and acting sub. *pro tem.* 5th grade, Kurnool district, is granted privilege leave for two months from date of relief.

**8th March 1904.**—*Transfer.*—B. K. Krishna Row, Ranger, 6th grade, Bellary district, is transferred to Kurnool district. To join forthwith.

**12th March 1904.**—No. 106.—The following Extra Assistant Conservators of Forests, who are now on probation in the 4th grade, are confirmed in their appointments with effect from the date noted against each :—

Mr. Henry O'Neill, from 29th November 1901.

Mr. Nicholas Manual Rego, from 29th November 1901.

Mr. James Tapp, from 21st January 1902.

Saiyid Burhanuddin Sahib Bahadur, from 21st January 1902.

Mr. E. C. M. Mascarenhas, from 10th February 1902.

Mr. J. A. Daly, from 10th February 1902.

**20th March 1904.**—*Transfers.*—The following transfers are ordered :—

Mr. H. O'Neill, Probationary Extra Assistant Conservator, from Tinnevely to Nilgiris. To join expeditiously.

Ranger C. S. Jesudasan Pillai, from Madura to Tinnevely, temporarily for two months. To join expeditiously.

**23rd March 1904.**—*Appointment.*—V. R. Venkatarama Aiyar is appointed Ranger, 5th grade, acting sub. *pro tem.*, Godavari district, from 18th September 1903 to 24th February 1904, both days inclusive.

**24th March 1904.**—No. 121.—Mr. Samuel Charles Moss, Extra Assistant Conservator of Forests, is granted an extension, by three days, of the six weeks' privilege leave granted him in Notification No. 437, published at page 1189 of Part I of the *Fort St. George Gazette*, dated 10th November 1903.

### 3.—BOMBAY GAZETTE.

**3rd March 1904.**—No. 9221.—Messrs. B. G. Deshpande and A. C. Robinson, Extra Assistant Conservators of Forests, respectively, delivered and received charge of the Bijapur Division on the forenoon of the 2nd February 1904.

**16th March 1904.**—No. 2094.—Mr. Balvant Ganesh Deshpande, Extra Assistant Conservator of Forests, 2nd grade, is allowed such privilege leave as may be due to him on the date he avails himself of it, in combination with furlough for such period as may bring the combined period of absence up to six months.

**30th March 1904.**—Mr. J. D. Maitland Kirwan, Divisional Forest Officer, East Khandesh, passed an examination in Marathi according to the Higher Standard on the 19th March 1904.

**30th March 1904.**—Mr. K. B. Gokhale, L.C.E., Sub-Divisional Forest Officer, S. D. Kanara, passed an examination in Kanarese according to the Higher Standard on 19th March 1904.

### 4.—BENGAL GAZETTE.

**7th March 1904.**—No. 1463.—Sir H. A. Farrington, Deputy Conservator of Forests, is, on return from the combined leave granted to him in Notification No. 914T.R., dated 5th June 1903, attached to the Sundarbans Forest Division.

**22nd March 1904.**—No. 1802.—Mr. W. LeG. Jacob, Assistant Conservator of Forests, 2nd grade, supernumerary, attached to the Buxa Division

was placed on special duty in the Kurseong Division from the 14th January 1904 till the 28th February 1904, both days inclusive. From the forenoon of the 29th February 1904 he was re-attached to the Buxa Division.

##### 5.—UNITED PROVINCES GAZETTE.

30th March 1904.—No. 1248 II. 665B-5.—Consequent on the transfer of Mr. F. A. Leete, Deputy Conservator of Forests, 3rd grade, to Burma—

Mr. J. C. Tulloch, Deputy Conservator of Forests, 3rd grade, provisionally substantive, to be confirmed in that grade but to officiate as Deputy Conservator of Forests, 2nd grade ;

Mr. H. G. Billson, Deputy Conservator of Forests, 4th grade, to be Deputy Conservator of Forests, 3rd grade, provisionally substantive ;

Mr. R. C. Milward, Deputy Conservator of Forests, 4th grade provisionally substantive (on furlough) to be confirmed in that grade ;

Mr. F. F. R. Channer, Assistant Conservator of Forests, 1st grade, to be Deputy Conservator of Forests, 4th grade, provisionally substantive, but to officiate as Deputy Conservator of Forests, 3rd grade ;

Mr. E. R. Stevens, Assistant Conservator of Forests, 1st grade, provisionally substantive, to be confirmed in that grade ; but to continue to officiate as Deputy Conservator of Forests, 4th grade ;

Mr. E. A. Courthope, Assistant Conservator of Forests, 2nd grade, to be Assistant Conservator of Forests, 1st grade, provisionally substantive, and to officiate as Deputy Conservator of Forests, 4th grade.

30th March 1904.—No. 1249-II 665B-5.—Consequent on the appointment of Mr. L. Mercer, Deputy Conservator of Forests, 2nd grade, to officiate as Conservator of Forests, Central Circle, on his return from deputation as Assistant Inspector-General of Forests and the reversion of Mr. T. J. Campbell from Officiating Conservator, 3rd grade, to his substantive appointment of Deputy Conservator, 1st grade—

Mr. W. H. Lovegrove, Officiating Deputy Conservator of Forests, 1st grade, to revert as Deputy Conservator of Forests, 2nd grade.

Mr. P. H. Clutterbuck, Deputy Conservator of Forests, 2nd grade, provisionally substantive, to revert as Deputy Conservator of Forests, 3rd grade, but to officiate as Deputy Conservator of Forests, 2nd grade ;

Mr. J. C. Tulloch, Officiating Deputy Conservator of Forests, 2nd grade, to revert as Deputy Conservator of Forests, 3rd grade ;

Mr. H. G. Billson, Deputy Conservator of Forests, 3rd grade, provisionally substantive, to revert as Deputy Conservator of Forests, 4th grade, but to officiate as Deputy Conservator of Forests, 3rd grade ;

Mr. F. F. R. Channer, Deputy Conservator of Forests, 4th grade, provisionally substantive, and officiating Deputy Conservator of Forests, 3rd grade, to revert as Assistant Conservator of Forests, 1st grade, but to officiate as Deputy Conservator of Forests, 4th grade ;

Mr. E. A. Courthope, Assistant Conservator of Forests, 1st grade, provisionally substantive, and officiating Deputy Conservator of Forests, 4th grade, to revert as Assistant Conservator of Forests, 2nd grade, but to officiate as Assistant Conservator of Forests, 1st grade.

30th March 1904.—No. 1250—II 865B-5.—Consequent on the departure on leave of Mr. H. G. Billson, Officiating Deputy Conservator of Forests, 3rd grade—

Mr. F. F. R. Channer, Officiating Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 3rd grade;

Mr. E. A. Courthope, Officiating Assistant Conservator of Forests, 1st grade, to officiate as Deputy Conservator of Forests, 4th grade.

#### 6.—PUNJAB GAZETTE.

14th March 1904.—No. 125.—Munshi Imam-ud-din, Extra Assistant Conservator of Forests, attached to the Chamba Forest Division, is granted two months' privilege leave, of which he availed himself with effect from the afternoon of the 13th February 1904.

29th March 1904.—No. 147.—Khan Bahadur Munshi Fazal Din, Extra Assistant Conservator of Forests, returned from leave and took over charge of the Shahpur Forest Division on the afternoon of the 29th February 1904, relieving Pandit Gokal Daa, Extra Assistant Conservator of Forests, who will remain in charge of the Jhelum Forest Division only, on and from that date.

The unexpired portion of Munshi Fazal Din's leave is hereby cancelled.

#### 7.—CENTRAL PROVINCES GAZETTE.

28th February 1904.—No. 127.—Extraordinary leave without allowances for one month is granted to 3rd grade Deputy Ranger Daolat Khan, Basim Division, under article 339 of the Civil Service Regulations, with effect from the date on which he may avail himself of it.

1st March 1904.—No. 1243.—The Chief Commissioner is pleased to direct that the list of Extra Assistant Conservators of Forests to-day stands as follows:—

1st Grade—3 (temporarily 5).

1. Rai Bahadur Mansukh Rai.

2. Mr. S. G. Pranjpe, B. A. (Ind.)

3. „ N. C. McLeod.

4. (Temporary appointment) Mr. J. J. Hobday, B. A. (Ind.)

5. (Temporary appointment) Mr. Ramchandra Krishna.

2nd Grade—2 (temporarily 5).

Mr. R. C. Thompson (seconded).

6. „ S. Srinivasalu.

7. „ L. K. Marten.

8. (Temporary appointment) Mr. W. G. J. Peake.

9. (Temporary appointment) Mr. W. G. Gilmore.

10. (Temporary appointment) Mr. A. Hunt.

3rd grade—8.

11. Mr. S. R. Parsons.

12. „ A. Ponnuswamy Mudaliar, sub. *pro tem*.

13. „ Ganga Parshad Khatri, sub *pro tem*.

4th grade—4.

14. „ B. Inamati Sham Rao.

15. „ Pandurang Narayan.

16. „ Faiz Baksh, sub. *pro tem*.

17. „ Amrit Lal Chatterji, sub. *pro tem*.

16th March 1904.—No. 1549.—Leave without pay for two months was granted to Mr. N. C. McLeod, Extra Assistant Conservator of Forests, in extension of the furlough granted him by Order No. 5237, dated the 16th September 1902.

The leave expired on the 15th February 1904.

**21st March 1904.**—No. 1659.—Privilege leave for six weeks, under articles 246 and 260 of the Civil Service Regulations, is granted to Mr. Dhanji Shah Nasarwanji Avasia, Extra Assistant Conservator of Forests, Chanda, with effect from the afternoon of the 9th February 1904.

Order No. 860, dated the 11th February 1904, is hereby cancelled.

### 8.—BURMA GAZETTE.

**2nd March 1904.**—No. 5.—Mr. A. G. H. Breithaupt, Extra Assistant Commissioner, made over, and Mr. S. A. Wood, Extra Assistant Conservator of Forests, received, charge of the Southern Shan States Forests Division on the afternoon of the 19th February 1904.

**5th March 1904.**—No. 115.—On his arrival in Burma Mr. F. A. Leete, Deputy Conservator of Forests, is posted to the charge of the Minbu Division, *vice* Mr. G. R. Long, Deputy Conservator of Forests, transferred.

**5th March 1904.**—No. 116.—On relief by Mr. F. A. Leete, Mr. G. R. Long, Deputy Conservator of Forests, is posted to the charge of the Southern Shan States Division, *vice* Mr. M. Hill, Deputy Conservator of Forests, on deputation to India.

**5th March 1904.**—No. 117.—On return from leave Mr. G. K. Parker, Deputy Conservator of Forests, was posted to special duty in the Pegu Circle.

**5th March 1904.**—No. 118.—Mr. G. K. Parker, Deputy Conservator of Forests, is transferred from the Pegu Circle and posted for duty in the Thaungyin Forest Division of the Tenasserim Circle.

**15th March 1904.**—No. 3.—With reference to Notification No. 117 (Forests), dated 5th March 1904, Mr. G. K. Parker reported his return from leave on the forenoon of the 9th February 1904, and was on special duty in the Pegu Circle till the 18th February 1904.

**16th March 1904.**—No. 5.—With reference to Revenue Department Notification No. 118 (Forests), dated the 5th March 1904, Mr. G. K. Parker, Deputy Conservator of Forests, reported himself at Moulmein, for duty in the Thaungyin Division, on the forenoon of the 24th February 1904.

**18th March 1904.** No. 7.—With reference to Revenue Department Notification No. 115 (Forests), dated the 5th March 1904, Mr. G. R. Long, Deputy Conservator of Forests, made over, and Mr. F. A. Leete, Deputy Conservator of Forests, received, charge of the Minbu Forest Division on the afternoon of the 17th March 1904.

**21st March 1904.**—No. 6.—With reference to Revenue Department Notification No. 35 (Forests), dated the 14th January 1904, Mr. J. W. Ryan, Extra Assistant Conservator of Forests, returned from the special duty on which he was placed, and took over charge of the Mergui Rubber Plantation from Mr. D. A. Allan, Ranger, on the afternoon of the 17th December, from which date the latter reverted to the charge of the Mergui Range.

This Office Notification No. 3, dated the 21st January 1904, is hereby cancelled.

### 9.—ASSAM GAZETTE.

**8th March 1904.**—No. 2267G.—Mr. A. R. Dicks, Deputy Conservator of Forests, in charge of the Sibsagar Forests Division, is granted privilege leave for two months and eleven days, combined with furlough for nine months and nineteen days, under articles 233 and 308 (b) of the Civil Service Regulations, with effect from the date on which he may have availed himself of it.

*8th March 1904.*—No. 2268G.—Mr. W. A. R. Doxat, Deputy Conservator of Forests, attached to the Sibsagar Forest Division, is appointed to the charge of that Division, with effect from the date of taking over charge from Mr. A. R. Dicks.

*24th March 1904.*—No. 2746G.—Mr. H. G. Young, Deputy Conservator in charge of the Lakhimpur Forests Division, is granted privilege leave for three months, combined with furlough for five months, under articles 233 and 308(b) of the Civil Service Regulations, with effect from the 15th April 1904, or the subsequent date on which he may be relieved.

*24th March 1904.*—No. 2747G.—Mr. F. H. Cavandish, Officiating Deputy Conservator in charge of the Cachar Forest Division, is transferred to Dibrugarh and appointed to the charge of the Lakhimpur Forest Division, during the absence on leave of Mr. H. G. Young, or until further orders.

*24th March 1904.*—No. 2748G.—Babu Janada Charn Sen, Extra Assistant Conservator of Forests, attached to Goalpara Forest Division, is transferred to Silchar, and appointed to the charge of the Cachar Forest Division.

#### 10.—MYSORE GAZETTE.

*28th March 1904.*—No. 747—7918.—In modification of Notification No. 407—5004, dated the 16th December 1903, Mr. M. Srinivasa Rao, Sub-Assistant Conservator of Forests, Shimoga District is, under article 165A of the Mysore Service Regulations, granted combined leave for a period of six months and twenty-two days, with effect from the 20th December 1903, the first twenty-two days whereof will be privilege leave and the remaining period leave on medical certificate.

## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

7th April 1904.—No. 376—77-4-F.—Mr. L. Mercer, officiating Conservator of Forests, 3rd grade, is appointed to hold charge of the Central Circle, United Provinces, of which he relieved Mr. T. J. Campbell, officiating Conservator, 3rd grade, on the forenoon of the 8th March 1904. From the same date Mr. Campbell reverted to his substantive appointment of Deputy Conservator, 1st grade, in the United Provinces.

20th April, 1904.—No. 418—55-14-F.—The services of the undermentioned officers are placed at the disposal of the Foreign Department, with effect from the dates noted against their names, for employment in the Kashmir State :—

- (1) Mr. A. W. Blunt, Deputy Conservator of Forests, 3rd (officiating 2nd) grade, Central Provinces, from the 10th March 1904.
- (2) Saiyid Mehdi Husain, Extra Assistant Conservator, 4th grade, United Provinces, from the 2nd April 1904.

### 2.—MADRAS GAZETTE.

13th March 1904.—R. Veeraswami Naidu, Deputy Ranger, 3rd grade and acting in the 2nd grade, Kistna district, is promoted temporarily to the 6th grade of Rangers with effect from 12th March 1904.

26th March 1904.—Leave.—Mr. A. F. X. Saldanha, Ranger, 2nd grade (sub; *ro tem.*), Nilgiris, is granted privilege leave, under article 260 of the Civil Service Regulations, for six weeks from date of relief.

30th March 1904.—No. 132.—The following appointments are made :—  
With effect from 17th February 1904, the date on which Mr. Gordon Hadfield retired from service.—

- (1) Mr. Thomas Pendrill Peaks, to be Deputy Conservator of Forests, 1st grade.
  - (2) Mr. Percy Manners Lushington, to be Deputy Conservator of Forests, 2nd grade.
  - (3) Mr. Francis Cowley Loftus Cowley-Brown to be Deputy Conservator of Forests, 3rd grade.
  - (4) Mr. James Stewart Scot, to be Deputy Conservator of Forests, 4th grade.
  - (5) Mr. Bernard Henry Barlow-Poole, to be Assistant Conservator of Forests, 1st grade, without prejudice to his acting appointment as Deputy Conservator of Forests, 4th grade.
  - (6) Mr. John Sinclair Battie to act as Deputy Conservator of Forests, 1st grade, during the absence of Mr. H. A. Gass on furlough.
  - (7) Mr. Claude du Pre Thornton to act as Deputy Conservator of Forests, 2nd grade, *vice* No. (6).
  - (8) Mr. Stephen Cox to act as Deputy Conservator of Forests 3rd grade, *vice* No. (7).
  - (9) Mr. William Aitchison to act as Deputy Conservator of Forests, 4th grade, during the absence of Mr. J. S. Scot on furlough.
- During the employment of Mr. F. A. Lodge as Conservator of Forests *vice* Mr. A. W. Lushington, on privilege leave—
- (10) Mr. Ernest Radcliff Murray to act as Deputy Conservator of Forests 1st grade.
  - (11) Mr. Arthur Bushe Jackson, to act as Deputy Conservator of Forest 2nd grade.
  - (12) Mr. Hugo Francis Andrew Wood to act as Deputy Conservator of Forests, 3rd grade.
  - (13) Mr. Robert Daniel Richmond to act as Deputy Conservator of Forests, 4th grade.

30th March 1904.—No. 133.—Mr. Frederick Adolphus Seager Extra Assistant Conservator of Forests, to act as District Forest Officer of Bellary during the absence of Mr. H. F. Arbuthnot on leave, or until further orders.

7th April 1904.—No. 142.—Under article 260 of the Civil Service Regulations, Saiyid Burhan-ud-din Sahib Bahadur, Extra Assistant Conservator of Forests, is granted privilege leave for three months with effect from 7th April 1904 or the date of his relief.

8th April 1904.—No. 146.—M. R. Ry. Coimbatore Muthuswami Maduranayagam Pillai Avargal to act as District Forest Officer, North Coimbatore, during the absence of Mr. P. M. Lushington on privilege leave, or until further orders. To join at once.

11th April 1904.—No. 145.—Under article 260 of the Civil Service Regulations Mr. Percy Manners Lushington, Deputy Conservator of Forests, is granted privilege leave for two months with effect from the date of his relief.

### 3.—BOMBAY GAZETTE.

7th April 1904.—No. 31.—Mr. L. S. Koppikar, Extra Assistant Conservator of Forests delivered over and Mr. H. W. Keys, Deputy Conservator of Forests, received charge of the Sub-Division office, Sattara, on the afternoon of the 21st March 1904.

12th April 1904.—No. 2746.—His Excellency the Governor in Council is pleased to make the following appointments:—

Mr. F. Gleadow to be Conservator of Forests, 3rd grade, *vice* Mr. R. S. F. Fagan, deceased.

Mr. H. Murray to be 1st grade Deputy Conservator of Forests *vice* Mr. Gleadow, promoted.

Mr. T. R. D. Bell to be 2nd grade Deputy Conservator of Forests *vice* Mr. Murray, promoted.

Mr. G. R. Duxbury to be 3rd grade Deputy Conservator of Forests, *vice* Mr. Bell, promoted.

2. His Excellency the Governor in Council is also pleased to appoint Mr. Showkiram Pribdas to the Extra Deputy Conservatorship, 4th grade, transferred from the Imperial to the Provincial list.

12th April 1904.—No. 2747.—Mr. A. G. Edie, Deputy Conservator of Forests, 4th grade, and Divisional Forest Officer, Nasik, is granted privilege leave of absence for six weeks.

12th April 1904.—No. 2748.—His Excellency the Governor in Council is pleased to appoint Mr. Dinkar Narayan Damle to act as Divisional Forest Officer, Nasik, during the absence on leave of Mr. A. G. Edie, or pending, further orders.

27th April 1904.—No. 3189.—Mr. Nanabhai Dadabhai Sataravala, L.C.E., Extra Assistant Conservator of Forests, 1st grade, and Sub-Divisional Forest Officer, Kolaba, is granted privilege leave of absence for two months.

27th April 1904.—No. 3190.—His Excellency the Governor in Council is pleased to appoint Mr. Jehangir Hormusji Irani, on relief by Mr. Gopal Manjunath Bhatkal, to act as 4th grade Extra Assistant Conservator of Forests, Kolaba, *vice* Mr. Nanabhai Dadabhai Sataravala, L.C.E., proceeding on leave, pending further orders.

27th April 1904.—No. 3190.—The furlough granted to Mr. Balvant Ganesh Deshpande, Extra Assistant Conservator of Forests, 2nd grade in Government Notification No. 2094, dated 16th March 1904, is cancelled.

### 4.—BENGAL GAZETTE.

11th April 1904.—No. 70 T.R.—Mr. H. H. Haines, F.C.H., Deputy Conservator of Forests, 3rd grade, in charge of the Singhbhum Working-plan, is deputed for special work to the Bettiah Estate, with effect from

the forenoon of the 1st March 1904. From the same date the following temporary promotions are ordered :—

Mr. F. Trafford, Deputy Conservator of Forests, 4th grade, to be Deputy Conservator of Forests, 3rd grade, *sub pro tem*.

Mr. J. L. Baker, Assistant Conservator of Forests 1st grade, and Deputy Conservator of Forests, 4th grade, to be Deputy Conservator of Forests, 4th grade, *sub pro tem*.

16th April 1904.—No. 224 T. R.—Mr. P. Tinne, Assistant Conservator of Forests, attached to the Darjeeling Division, is transferred to the Tieth Division, with effect from the 1st April 1904, and is appointed to hold charge of that Division, with effect from the forenoon of the 4th idem until he is relieved by Mr. H. H. Haines, Deputy Conservator of Forests, or until further orders.

17th April 1904.—No. 244 T. R.—Mr. H. H. Haines, F. C. H., Deputy Conservator of Forests, on return from deputation to the Bettiah Estate resumed charge of his duties as Working Plans Officer, in the Singbhum Forest Division, on the afternoon of the 21st March 1904.

From the same date the following reversions are ordered :—

Mr. F. Trafford, Deputy Conservator of Forests, 3rd grade, *sub pro tem* reverted to his substantive appointment of Deputy Conservator of Forests, 4th grade.

Mr. J. L. Baker, Deputy Conservator of Forests, 4th grade, *sub pro tem* reverted to his substantive appointment of Assistant Conservator of Forests, 1st grade.

19th April, 1904.—No. 295 T. R.—Mr. R. G. A. Hannah, Extra Assistant Conservator of Forests, Sunderbans, is appointed to hold charge of that Division during the absence, on leave, of Mr. W. F. Lloyd, Deputy Conservator of Forests, with effect from the afternoon of the 29th March 1904, until he is relieved by Sir Henry A. Farrington, Deputy Conservator of Forests.

19th April 1904.—No. 321 T. R.—Consequent on the departure of Mr. W. F. Lloyd, Deputy Conservator of Forests, 3rd grade, on the combined leave granted to him in Notification No. 1278 For., dated 29th February 1904, on the afternoon of the 29th March 1904, the following temporary promotions are ordered with effect from the 30th March 1904 :—

Mr. F. Trafford, Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 2nd grade.

Mr. J. L. Baker, Assistant Conservator of Forests, 1st grade, to officiate as Deputy Conservator of Forests, 4th grade.

##### 5.—UNITED PROVINCES GAZETTE.

26th April 1904.—No. 1609.—11-186A-12.—The following temporary promotions and reversions are notified for general information :—

| Entry No. | With effect from | Consequent on                               | Name.                | From  | To   |
|-----------|------------------|---|----------------------|---|--|
| 1         | 28th March 1904. | The return from leave of Mr. H. C. Milward. | Mr. R. C. Milward.   | Deputy Conservator of Forests, 4th grade.             | Officiating Deputy Conservator of Forests, 3rd grade.    |
|           |                  |   | Mr. F. F. R. Channer | Officiating Deputy Conservator of Forests, 3rd grade. | Officiating Deputy Conservator of Forests, 4th grade     |
|           |                  |   | Mr. B. A. Courthope  | Officiating Deputy Conservator of Forests, 4th grade  | Officiating Assistant Conservator of Forests, 1st grade. |



## 6.—PUNJAB GAZETTE.

19th April 1904.—No. 179.—With reference to Notification No. 125, dated 14th March 1904. Munshi Imam-ud-din, Extra Assistant Conservator of Forests, attached to the Chamba Forest Division, returned from leave on the afternoon of the 20th March 1904.

The unexpired portion of his leave is hereby cancelled.

27th April 1904.—No. 194.—A. L. No. 6.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each.

Notifications No. 28—A. L. No. 3 of 15th January 1904, and No. 104—A. L. No. 5 of 29th February 1904 are hereby cancelled :—

| Name.                | Present grade.  | Grade to which promoted or reverted   | With effect from     | REMARKS.   |
|----------------------|---|---|----------------------|--|
| Mr. R. Williamson    | Provisional Deputy Conservator, 3rd grade.  | Officiating Deputy Conservator, 3rd grade.  | 15th September 1903. | Consequent on Mr. Blunt's appointment as Officiating Conservator.  |
| Mr. S. L. Kenny...   | Officiating Deputy Conservator, 4th grade.  | Officiating Deputy Conservator, 3rd grade.  |                      |  |
| Mr. A. L. McIntire   | Provisional Deputy Conservator, 1st grade, and Officiating Deputy Conservator, 3rd grade. | Deputy Conservator, 1st grade, and Officiating Conservator, 3rd grade.                    |                      |  |
| Mr. H. A. Hoghton    | Deputy Conservator, 2nd grade, and Officiating Conservator, 3rd grade.                    | Provisional Deputy Conservator, 1st grade, and Officiating Conservator, 3rd grade.        | 13th October 1903.   | Consequent on the retirement of Mr. L. Gibson Smith from 13th October 1903.  |
| Mr. C. Somers-Smith. | Provisional Deputy Conservator, 2nd grade.  | Deputy Conservator, 2nd grade.  |                      |  |
| Mr. A. V. Monroe ... | Officiating Deputy Conservator, 2nd grade.  | Provisional Deputy Conservator, 2nd grade.  |                      |  |
| Mr. R. Williamson    | Provisional Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade. | Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.             |                      |  |
| Mr. C. O. Hanson     | Deputy Conservator, 4th grade.  | Provisional Deputy Conservator, 3rd grade.  |                      |  |
| Mr. C. M. McOris     | Provisional Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade. | Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade.             |                      |  |
| Mr. S. L. Kenny ...  | Officiating Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade. | Provisional Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade. |                      |  |
|                      |   |   |                      | Mr. Carroll having become permanent Assistant Conservator, 1st grade, resumes his place above Mr. Gibson according to seniority. |

| Name.                 | Present grade.   | Grade to which promoted or reverted.  | With effect from    | REMARKS.   |
|-----------------------|--|---|---------------------|--|
| Mr. J. C. Carroll ... | Provisional Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade. | Assistant Conservator 1st grade, and Officiating Deputy Conservator, 4th grade. |                     |  |
| Mr. R. M. Williamson. | Officiating Deputy Conservator, 2nd grade.   | Deputy Conservator, 3rd grade.  | 19th October 1903.  | Consequent on Mr. Monro's return from privilege leave.                                 |
| Mr. S. L. Kenny ...   | Officiating Deputy Conservator, 3rd grade.   | Provisional Deputy Conservator, 4th grade.                                      |                     |  |
| Mr. J. E. Barrett...  | Provisional Deputy Conservator, 3rd grade.   | Deputy Conservator, 3rd grade, Officiating Deputy Conservator, 2nd grade.       | 27th October 1903.  |  |
| Mr. J. E. Barrett...  | Officiating Deputy Conservator, 2nd grade.   | Deputy Conservator, 3rd grade.  |                     | Consequent on Mr. E. M. Coventry's departure on transfer to Assam.                     |
| Mr. C. M. McOrie.     | Officiating Deputy Conservator, 3rd grade.   | Deputy Conservator, 4th grade.  | 30th November 1903. |  |
| Mr. H. A. Hoghton     | Provisional Deputy Conservator, 1st grade, and Officiating Conservator.                      | Deputy Conservator, 1st grade, and Officiating Conservator.                     |                     |  |
| Mr. A. E. Lowrie...   | Officiating Deputy Conservator, 1st grade.   | Provisional Deputy Conservator, 1st grade.                                      |                     |  |
| Mr. A. V. Monro ..    | Provisional Deputy Conservator, 2nd grade.   | Deputy Conservator, 2nd grade.  |                     |  |
| Mr. A. W. Blunt...    | Officiating Deputy Conservator, 2nd grade.   | Provisional Deputy Conservator, 2nd grade.                                      |                     |  |
| Mr. C. O. Hanson      | Provisional Deputy Conservator, 3rd grade.   | Deputy Conservator, 3rd grade.  |                     |  |
| Mr. B. O. Coventry    | Officiating Deputy Conservator, 3rd grade.   | Provisional Deputy Conservator, 3rd grade.                                      |                     |  |
| Mr. S. L. Kenny...    | Provisional Deputy Conservator, 4th grade.   | Deputy Conservator, 4th grade.  | 9th December 1903.  | Consequent on Mr. A. L. McIntire's confirmation as Conservator from 9th December 1903. |

| Name.                  | Present grade.   | Grade to which promoted or reverted.   | With effect from    | REMARKS.   |
|------------------------|--|--|---------------------|--|
| Mr. B. S. Hole ...     | Officiating Deputy Conservator, 4th grade.   | Provisional Deputy Conservator, 4th grade.                                       |                     |  |
| Mr. D. O. Witt ...     | Ditto ...  | Ditto ...  |                     |  |
| Mr. J. C. Carroll      | Ditto ...  | Ditto ...  |                     |  |
| Mr. A. Dunbar Brander. | Provisional Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade. | Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade. |                     |  |
| Mr. J. E. Barrett...   | Deputy Conservator, 3rd grade.   | Officiating Deputy Conservator, 2nd grade.                                       | 10th December 1903. | Consequent on Mr. Blunt's proceeding on three months' privilege leave from 10th December 1903. |
| Mr. C. M. McCrie.      | Deputy Conservator, 4th grade.   | Officiating Deputy Conservator, 3rd grade.                                       |                     |  |
| Mr. R. M. Williamson   | Deputy Conservator, 3rd grade.   | Officiating Deputy Conservator, 2nd grade.                                       | 14th December 1903. | Consequent on Mr. Fisher's appointment as Officiating Conservator from 14th December 1903.     |
| Mr. S. L. Kenny ...    | Deputy Conservator, 4th grade.   | Officiating Deputy Conservator, 3rd grade.                                       |                     |  |

NOTE.—From 14th December 1903 Messrs. Barrett and McCrie will continue to officiate in the 2nd and 3rd grades, respectively, in suite of Mr. Fisher, Officiating Conservator, and Messrs. Williamson and Kenny will officiate in the vacancies due to the privilege leave of Mr. Blunt.

#### 7.—CENTRAL PROVINCES GAZETTE.

24th March 1904.—No. 217.—Under the authority conferred by article 31, clause (1), of the Forest Department Code, Lala Sita Ram, a private student of the Imperial Forest School, Dehra Dun, who has duly obtained the Higher Standard Certificate of the school, is appointed, on probation, as Ranger, 6th grade, with effect from the 2nd March 1904, the date on which he reported himself for duty to the Divisional Forest Officer, Saugor.

29th March 1904.—No. 219.—Shiv Parshad, D. D. F., Deputy Ranger, 1st grade, on Rs. 40, in the Narsinghpur Forest Division, who is qualified for promotion according to article 31 (1) (c) of the Forest Department Code, is appointed as Ranger, 6th grade, on Rs. 50, on probation, with effect from the 1st April 1904.

2nd April 1904.—No. 1.—Furlough on half pay for seven months and eight days, under articles 335 and 338 of the Civil Service Regulations, is granted to Ahmad Sahab, Deputy Ranger, 1st grade, Permanent Establishment, Amraoti Division, with effect from 23rd February 1904.

7th April 1904.—No. 1982.—On return from the two months' leave without pay granted him by Order No. 1549, dated the 16th March 1904, in extension of the furlough granted by Order No. 5237, dated the 16th

September 1902, Mr. N. C. McLeod, Extra Assistant Conservator of Forests, was attached to the Direction Division, Southern Circle, Central Provinces, from the 15th February to the 9th March 1904, inclusive.

7th April 1904.—No. 1983.—Mr. N. C. McLeod, Extra Assistant Conservator of Forests, is ordered to assume charge of the Seoni Forest Division from Mr. B. I. Sham Rao, Extra Assistant Conservator of Forests.

7th April 1904.—No. 1984.—On relief by Mr. N. C. McLeod, Extra Assistant Conservator of Forests, Mr. B. I. Sham Rao, Extra Assistant Conservator of Forests, is attached to the Seoni Division until further orders.

### 8.—BURMA GAZETTE.

21st March 1904.—No. 136.—The following promotions are ordered in the Forest Department:—

With effect from the 29th November 1903, consequent on the transfer to Madras of Mr. C. M. Hodson, Deputy Conservator, 3rd grade—

Mr. A. M. Burn-Murdoch, Deputy Conservator, 3rd grade, *prov. sub.* to be confirmed in his appointment.

Mr. F. Linnell, Deputy Conservator, 4th (officiating 3rd) grade, to be Deputy Conservator 3rd grade, *prov. sub.*

Mr. G. E. S. Cubitt, Deputy Conservator, 4th grade, *prov. sub.* (Officiating Deputy Conservator, 3rd grade), to be confirmed in his appointment and to continue to officiate as Deputy Conservator, 3rd grade.

Mr. H. W. A. Watson, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, *prov. sub.*

Mr. A. Rodger, Assistant Conservator, 1st grade, *prov. sub.* (officiating Deputy Conservator, 4th grade), to be confirmed in his appointment and to continue to officiate as Deputy Conservator, 4th grade.

Mr. L. C. Davis, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade, to be Assistant Conservator, 1st grade, *prov. sub.*; and to continue to officiate as Deputy Conservator, 4th grade.

23rd March 1904.—No. 7.—With reference to Revenue Department Notifications Nos. 488 to 499 (Forests), which appeared in Part I of the *Burma Gazette* of the 12th December 1903, Mr. G. G. Collins, Deputy Commissioner, assumed charge of the duties of Forest Settlement Officer, Thaton district, on the afternoon of the 17th December 1903, and relinquished charge of Forest settlement duties on afternoon of the 11th February 1904.

2nd April 1904.—No. 144.—Mr. C. R. Dun, Deputy Conservator of Forests, has been permitted by His Majesty Secretary of State for India to return to duty within the period of his leave.

2nd April 1904.—No. 145.—Mr. R. C. A. Pinder, Extra Assistant Conservator of Forests, is transferred from the charge of the Shweli Forest Subdivision and is attached to the Ruby Mines Forest Division.

5th April 1904.—No. 8.—With reference to Revenue Department Notification No. 116 (Forests), dated 5th March 1904, Mr. G. R. Long, Deputy Conservator of Forests received charge of the Southern Shan States Forest Division from Mr. S. A. Wood, Extra Assistant Conservator of Forests, on the afternoon of the 4th April 1904.

**9.—ASSAM GAZETTE.**

13th April 1904.—No. 3453 G.—Pending the arrival of Babu Juanadd Charan Sen, Babu Tarakisor Gupta Extra Assistant Conservator in charge of the Sylhet Forest Division, is appointed temporarily to hold charge of the Cachar Forest Division in addition to his own duties, with effect from the date of receiving charge from Mr. F. H. Cavendish.

**10.—MYSORE GAZETTE.**

7th April 1904.—No 761—8260.—Under article 188 of the Mysore Service Regulations, Mr. K. Muthaiya, Sub-Assistant Conservator of Forests, Mysore District, is granted privilege leave of absence for one month with effect from the 1st April 1904, or such other date as he may avail himself of the same.

18th April 1904.—No. 784—8601.—The one month and fifteen days' privilege leave of absence granted in Government Proceedings No. 515-16—6301-2, dated the 4th February 1904, to Mr. S. A. Babu Rao, District Forest Officer, Kolar, is hereby extended by one day.

## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

7th April 1904.—No. 376—77-4-F.—Mr. L. Mercer, officiating Conservator of Forests, 3rd grade, is appointed to hold charge of the Central Circle, United Provinces, of which he relieved Mr. T. J. Campbell, officiating Conservator, 3rd grade, on the forenoon of the 8th March 1904. From the same date Mr. Campbell reverted to his substantive appointment of Deputy Conservator, 1st grade, in the United Provinces.

20th May 1904.—No. 542—75-7-F.—Mr. T. A. Hauxwell, Conservator of Forests, 2nd grade, in charge of the Northern Circle, Upper Burma, is granted privilege leave for three months, combined with furlough for six months, with effect from the 12th May 1904.

Mr. H. Slade, Conservator, 3rd (officiating 2nd) grade, is transferred from the Pegu Circle and appointed to the charge of the Northern Circle, of which he relieved Mr. T. A. Hauxwell on the afternoon of the 11th May 1904.

Mr. J. Copeland, Deputy Conservator, 1st grade, Upper Burma, is appointed to officiate as Conservator, 3rd grade, in charge of the Pegu Circle, of which he relieved Mr. H. Slade on the afternoon of the 11th May 1904.

### 2.—MADRAS GAZETTE.

16th April 1904.—V. Narayana Aiyar, on return from Dehra Dun, to be Ranger, 6th grade, sub. *pro tem.*, with effect from 26th March 1904.

26th April 1904.—No. 171.—Mr. Stephen Cox to act as District Forest Officer, North Coimbatore, during the absence of Mr. P. M. Lushington, on privilege leave.

*Note.*—This supersedes Notification No. 146, published at page 381, Part I of the *Fort St. George Gazette*, dated 12th April 1904.

26th April 1904.—No. 172.—Mr. Stephen Cox to be District Forest Officer, Kurnool East, with effect from 1st July 1904.

4th May, 1904.—Syed Yassim Sihil, Acting Ranger, 6th grade, Godavari district, is granted privilege leave for two months from the date of availing himself of the same.

### 3.—BOMBAY GAZETTE.

29th April 1904.—No. 248.—Messrs. J. H. Irani, acting Extra Assistant Conservator of Forests, and G. M. Bhatkal, Extra Assistant Conservator of Forests, 4th grade, respectively delivered over and received charge of the Sub-Division Forest office, East Khandesh, on the 11th April 1904, in the afternoon.

29th April, 1904.—No. 501.—Mr. N. D. Satarawala, Extra Assistant Conservator of Forests, and Mr. W. A. Wallinger, Divisional Forest Officer, Kolaba, respectively delivered over and received charge of the Sub-Divisional Forest office, Kolaba, on the afternoon of the 10th April 1904.

27th April, 1904.—No. 505.—Mr. J. K. N. Kabraji, acting Collector, handed over and Mr. A. W. W. Mackie, Assistant Collector, received charge of the Ratnagiri Forest Division on the afternoon of 10th April 1904.

3th May, 1904.—No. 300.—Mr. L. S. Koppikar, Extra Assistant Conservator of Forests, returned from one month's privilege leave and assumed charge of the Sub-Division Forest office from Mr. H. W. Keys, Deputy Conservator of Forests, on the afternoon of the 20th April 1904.

6th May 1904.—No. 325.—Messrs. A. G. Edie, Deputy Conservator of Forests, and D. N. Damale, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest office, Nasik, on the afternoon of the 16th April 1904.

14th May 1904.—No. 426.—Mr. G. M. Bhatkal, Extra Assistant Conservator of Forests, 4th grade, reported himself for duty to the Divisional Forest Officer, Poona, on the forenoon of the 4th May 1904.

16th May 1904.—No. 3633.—Mr P. E. Aitchison, Second Grade Assistant Conservator of Forests, Southern Circle, passed on 17th March, 1904, an examination in subjects prescribed in No. VI of the Rules published in Government Notification No. 2, dated 3rd January 1894, for the examination of officers of the Forest Department.

#### 4.—BENGAL GAZETTE.

2nd May 1904.—No. 509 T. R.—Sir Henry A. Farrington, Deputy Conservator of Forests, attached to the Sunderbans Division, is appointed to hold charge of that division, during the absence, on leave of Mr. W. F. Lloyd, Deputy Conservator of Forests, or until further orders, with effect from the forenoon of the 13th April 1904.

#### 5.—UNITED PROVINCES GAZETTE.

26th April 1904.—No. 1609.—II-186A-12.—The following temporary promotions and reversions are notified for general information :—

| Entry No. | With effect from | Consequent on                               | Name.               | From  | To   |
|-----------|------------------|---|---------------------|---|--|
| 1         | 28th March 1904. | The return from leave of Mr. H. C. Milward. | Mr R. C. Milward.   | Deputy Conservator of Forests, 4th grade.             | Officiating Deputy Conservator of Forests, 3rd grade.    |
|           |                  |   | Mr. F.F.E. Channer. | Officiating Deputy Conservator of Forests, 3rd grade. | Officiating Deputy Conservator of Forests, 4th grade     |
|           |                  |   | Mr. E.A. Courthope. | Officiating Deputy Conservator of Forests, 4th grade. | Officiating Assistant Conservator of Forests, 1st grade. |

3rd May 1904.—No. 1729—II 33-1904—Lala Har Swarup, Extra Assistant Conservator of Forests, in charge of the Pilibhit Forest Division of the Oudh Circle, leave on medical certificate for three months, from 12th April 1904.

4th May 1904.—No. 1730—II, 33—1904—Mr. E. L. Haslett, Extra Assistant Conservator of Forests, attached to the Kumaun Forest Division of the Central Circle, to hold charge of the Pilibhit Forest Division of the Oudh Circle, *vice* Lala Har Swarup, granted leave.

10th May 1904.—No. 1789—II. 1685-B-5.—Consequent on the deputation to foreign service of Saiyid Mahdi Hasan, Extra Assistant Conservator of Forests, 4th grade, Forest Ranger Madho Parshad to be Extra Assistant Conservator of Forests, 4th grade, *sub pro tem*.

16th May 1904.—No. 1879—II, 207-1904.—Lala Permeshwari Din, Extra Assistant Conservator of Forests, attached to the Kheri Forest Division, Oudh Circle, privilege leave for three months, from 15th May 1904 for subsequent date.

19th May 1904.—No. 384—VII, 455 B-25.—The undermentioned gentlemen are declared to have passed the departmental examination of junior officers held on the 5th April 1904 and following days in the subjects specified below :—

*Forest Officers Vernacular. By the higher standard.*

Mr. R. St. G. Burke.

„ F. Canning.

*Land Revenue Systems.*

Mr. T. Carr.

*Forest Law.*

Mr. R. St. G. Burke.

Koushi Ram.

*Procedure and Accounts.*

Mr. R. St. G. Burke.

„ F. Canning.

6.—PUNJAB GAZETTE.

6th May 1904.—No. 214.—A. L. No. 7.—Mr. A. J. Gibson, Officiating Deputy Conservator of Forests, returned from three months' privilege leave, and was attached to the Bashahr Division for Working-Plan duty on the forenoon of the 12th April 1904.

7.—CENTRAL PROVINCES GAZETTE.

29th April 1904.—No. 10.—Privilege leave on full pay for six weeks, under Article 260 of the Civil Service Regulations, is granted to Deputy Ranger Fazal Azim, Permanent Establishment, on special duty with Direction Division, with effect from the 4th May 1904.

3rd May 1904.—No. 2601.—Mr. H. A. Houghton, Deputy Conservator of Forests, has been granted, by His Majesty's Secretary of State for India, four months' leave on medical certificate in extension of the leave granted him by Government of India, Revenue and Agriculture Department, Notification No. 1483-F-244-3, dated the 23rd December 1903, as amended by Notification No. 84-F-244-15, dated the 27th January 1904.

5th May 1904.—No. 2641.—Mr. B. Inamati Shama Rao, Extra Assistant Conservator of Forests, was attached to the Seoni Forest Division from the afternoon of the 28th December 1903 to the afternoon of the 5th January 1904.

6th May 1904.—No. 2.—Under the authority conferred by Section 31, clause (1), of the Forest Department Code. 5th edition, the undermentioned stipendiary students, who were deputed in April 1902 to the Imperial Forest School, Dehra Dun, and who have duly obtained the Higher Standard certificates of the School, are appointed Rangers, 6th grade, on Rs. 50 per mensem on probation for six months, with effect from the 1st April 1904, and are posted to the Divisions specified opposite their names :—

- |                               |   |                    |
|-------------------------------|---|--------------------|
| (1) Shridhar Jageshwar Chate. | { | Balaghat Division. |
| (2) Narhar Waman Joshi        |   |                    |
| (3) Ganpati Buapji Dharme,    |   |                    |
- Raipur Division.

6th May 1904.—No. 12.—Sick leave on medical certificate for six months, under Article 340 of the Civil Service Regulations, is granted to Deputy Ranger Ashik Ali, Permanent Establishment, Basim Division, with effect from the 5th March 1904



6th May 1904.—No. 13.—In consequence of the absence of Deputy Ranger Ashik Ali, on leave on medical certificate, the following officiating promotions are made with effect from 1st May 1904 :—

| Name.             | Present class and grade.  | Class and grade to which promoted. |
|-------------------|---------------------------|------------------------------------|
| Lad Khan ...      | Deputy Ranger, 2nd grade. | Deputy Ranger, 1st grade.          |
| Thamman Singh ... | Deputy Ranger, 3rd grade. | Deputy Ranger, 2nd grade.          |
| Sheikh Jamal ...  | Forester, 1st grade ...   | Deputy Ranger, 3rd grade.          |

10th May 1904.—No. 2746.—Mr. S. R. Parsons, Extra Assistant Conservator of Forests, Nimar, is ordered to assume charge of the Damoh Forest Division from Mr. Ramchandra Krishna, Extra Assistant Conservator of Forests.

10th May, 1904.—No. 2747.—On relief by Mr. S. R. Parsons, Extra Assistant Conservator of Forests, Mr. Ramchandra Krishna is transferred to the Nimar Forest Division as an Assistant to the Forest Divisional Officer.

10th May 1904.—No. 2758.—Privilege leave for three months, under Articles 246 and 260 of the Civil Service Regulations, is granted to Rai Bahadur Mansukh Rai, Extra Assistant Conservator of Forests and Working Plans Officer, Direction Division, Amraoti, with effect from the 1st July 1904, or the subsequent date on which he may avail himself of it.

#### 8.—BURMA GAZETTE.

17th April 1904.—No. 158.—Mr. J. C. Hopwood, Assistant Conservator of Forests, was transferred from Thayetmyo to Rangoon and placed on special duty in the Office of the Conservator of Forests, Pegu Circle, from the forenoon of the 1st June 1902 to the afternoon of the 18th September 1902.

17th April 1904.—No. 159.—Mr. J. C. Hopwood, Assistant Conservator of Forests, was transferred from his duties in the Office of the Conservator of Forests, Pegu Circle, Rangoon, and attached to the Office of the Conservator of Forests, Tenasserim Circle, Rangoon, from the forenoon of the 19th September 1902 to the afternoon of the 31st October 1902.

17th April 1904.—No. 160.—(CORRIGENDUM).—In this Department Notification No. 439 (Forests), dated the 30th October 1902, for "Thayetmyo Forest Division" read "Office of the Conservator of Forests, Tenasserim Circle, Rangoon."

17th April 1904.—No. 167.—Mr. S. F. Hopwood, Assistant Conservator of Forests, is transferred from Pyinmana, and is appointed Personal Assistant to the Conservator of Forests, Southern Circle.

30th April, 1904.—No. 179 (Forests).—Mr. H. H. Forteach, Deputy Conservator of Forests, is transferred from Myitkyina to the charge of the Mandalay Forest Division of the Southern Circle, *vice* Mr. J. Copeland, Deputy Conservator of Forests, transferred.

30th April 1904.—No. 180 (Forests).—Mr. J. Messer, Deputy Conservator of Forests, Katha Division, is posted to the charge of the Myitkniya Division in addition to his other duties as a temporary measure.

30th April 1904.—No. 13.—Mr. C. H. Hearsey, Forest Ranger, 3rd grade, is transferred from the Thauogyin to the Ataran Division, with effect from the forenoon of the 11th April 1904.

4th May 1904.—No. 189 (Forest).—Under the provisions of Articles 246, 260 and note to Article 251 of the Civil Service Regulations, privilege leave for three months and fifteen days is granted to Mr. R. E. Marsden, Assistant Conservator of Forests, with effect from the date on which he may avail himself of it.

4th May, 1904.—No. 190.—This Department Notification No. 19, dated the 11th January 1904, is hereby cancelled.

5th May 1904.—No. 183.—Under the provisions of Articles 246, 260, 233 and 316 of the Civil Service Regulations, privilege leave for two months and twenty-three days, and special leave on urgent private affairs in continuation thereof for three months and seven days, is granted to Mr. F. H. Todd, Deputy Conservator of Forests, with effect from the 22nd April 1904.

5th May 1904.—No. 184.—On relief by Mr. Lawrence, Mr. F. H. Todd, Deputy Conservator of Forests, was placed on special duty and attached to the Direction Division, Southern Circle, from the 16th to the 22nd April, 1904.

5th May 1904.—No. 185.—Mr. A. Lawrence, officiating Deputy Conservator of Forests, is posted to the charge of the Yaw Division in place of Mr. F. H. Todd, Deputy Conservator of Forests, proceeding on leave.

5th May 1904.—No. 12.—With reference to Revenue Department Notification No. 167 (Forests), dated 20th April 1904, Mr. S. F. Hopwood, Assistant Conservator of Forests, assumed charge of his duties as Personal Assistant to the Conservator of Forests, Southern Circle, on the afternoon of the 22nd April 1904.

6th May 1904.—No. 191.—The following promotions are ordered in the Forest Department:—

With effect from the 4th December 1903, consequent on the retirement of Mr. H. Calthrop, Deputy Conservator of Forests, 2nd grade:—

Mr. M. Hill, Deputy Conservator, 2nd grade, *prov. sub.*, to be confirmed in his appointment.

Mr. H. Carter, Deputy Conservator, 3rd (officiating 2nd) grade, to be Deputy Conservator, 2nd grade, *prov. sub.*

Mr. H. H. Forteach, Deputy Conservator, 3rd grade, *prov. sub.*, to be confirmed in his appointment.

Mr. C. B. Smales, Deputy Conservator, 4th grade, to be Deputy Conservator, 3rd grade, *prov. sub.*

Mr. A. Lawrence, Assistant Conservator, 1st grade, *prov. sub.* (officiating Deputy Conservator, 4th grade), to be confirmed in his appointment, and to continue to officiate as Deputy Conservator, 4th grade.

Mr. R. E. Marsden, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to be Assistant Conservator, 1st grade, *prov. sub.*

No. 192.—The following alterations in rank are ordered in the Forest Department:—

(1) With effect from the 9th February 1904, consequent on the return from leave of Mr. G. K. Parker, Deputy Conservator of Forests, 4th grade, *prov. sub.*—

Mr. L. C. Davis, Assistant Conservator, 1st grade, *prov. sub.* (officiating Deputy Conservator, 4th grade), to revert to his *prov. sub.* appointment.

(2) With effect from the 25th February 1904, consequent on the deputation of Mr. M. Hill, Deputy Conservator of Forests, 2nd grade:—

Mr. F. J. Branthwaite, Deputy Conservator, 3rd grade, to be Deputy Conservator, 2nd grade, *prov. sub.*

Mr. C. W. A. Bruce, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. G. K. Parker, Deputy Conservator, 4th grade, *prov. sub.*, to officiate as Deputy Conservator, 3rd grade.

Mr. L. C. Davis, Assistant Conservator, 1st grade, *prov. sub.*, to officiate as Deputy Conservator, 4th grade.

7th May 1904.—No. 186.—Mr. H. L. P. Walsh, Officiating Deputy Conservator of Forests, is transferred from Mogok and posted to the charge of the Pyinmana Division in place of Mr. S. Carr, Deputy Conservator of Forests, proceeding on leave.

7th May 1904.—No. 187.—Under the provisions of Articles 233, 260 and 316 of the Civil Service Regulations, Mr. S. Carr, Deputy Conservator of Forests, is granted privilege leave for two months and twenty-four days, and special leave on urgent private affairs in continuation thereof for three months and six days, with effect from the 24th May 1904, or the later date on which he may avail himself of the privilege leave.

7th May 1904.—No. 2.—Mr. H. H. Forteach, Deputy Conservator of Forests, made over, and Mr. J. Messer, Deputy Conservator of Forests, assumed, charge of the Myitkyina Division on the afternoon of the 2nd May 1904, in addition to his duties as Divisional Forest Officer of the Katha Division.

9th May 1904.—No. 13.—With reference to Revenue Department Notification No. 185 (Forests), dated 5th May 1904, Mr. F. H. Todd, Deputy Conservator of Forests, made over, and Mr. A. Lawrence, Officiating Deputy Conservator of Forests, received, charge of the Yaw Forest Division on the afternoon of the 18th April 1904.

13th May 1904.—No. 209.—On return from leave Mr. C. R. Dun, Deputy Conservator of Forests, is posted to the charge of the Lower Chindwin Division *vice* Mr. C. W. Doveton, Deputy Conservator of Forests, transferred.

13th May 1904.—No. 210.—Mr. C. W. Doveton, Deputy Conservator of Forests, is transferred from Monywa, and is posted to the charge of the Prome Division *vice* Mr. A. H. M. Lawson, Deputy Conservator of Forests, transferred.

13th May 1904.—No. 211.—Mr. A. H. M. Lawson, Deputy Conservator of Forests, is transferred from Prome and is posted to the charge of the Bassein-Myaungmya Division, *vice* Mr. L. C. Davis, Officiating Deputy Conservator of Forests, proceeding on leave.

13th May 1904.—No. 212.—Under the provisions of Articles 233, 246, 260 and 308 (b) of the Civil Service Regulations, privilege leave for three months and furlough in continuation thereof for fifteen months is granted to Mr. W. T. T. McHarg, Deputy Conservator of Forests, with effect from the date on which he may avail himself of the privilege leave.

13th May 1904.—No. 213.—Mr. H. W. A. Watson, Officiating Deputy Conservator of Forests, is posted to the charge of the Toungoo Division, *vice* Mr. W. T. T. McHarg, Deputy Conservator of Forests, proceeding on leave.

#### 9.—ASSAM GAZETTE.

12th May, 1904.—No. 4303G.—General Department Notification No. 8453G., dated the 13th April 1904, appointing Babu Tara Kisor Gupta Extra Assistant Conservator of Forests, Sylhet Division, temporarily to hold charge of the Cachar Forest Division, in addition to his own duties, is cancelled.

**20th May 1904.**—No. 4598G. —Privilege leave of absence for one month and twelve days, combined with special leave for four months and eighteen days, under Articles 233 (ii) and 316 of the Civil Service Regulations is granted to Mr. G. M. Townshend, Assistant Conservator of Forests, attached to the Kamrup Forest Division, with effect from the 11th March 1904.

**10.—MYSORE GAZETTE.**

**30th April 1904** —No. 796—8962.—Under Article 188 of the Mysore Service Regulations, Mr. V. Narasinha Murti Rao, Sub-Assistant Conservator of Forests, Shimoga District, was granted privilege leave of absence for eight days, viz., from the 24th to 31st March 1904, inclusive.

**5th May 1904** —No. 804—9140. —The following promotion is ordered, with effect from the 19th April 1904 :—

Mr. C. Appaiya, B.A. Assistant Conservator of Forests, 2nd class, to be Assistant Conservator of Forests, 1st class, *vice* Mr. G. E. Ricketts, promoted as Deputy Conservator, 3rd class (supernumerary).

**7th May 1904.**—No. 809—9210.—Under Article 188 of the Mysore Service Regulations, Mr. M. Venkatnarnappa, District Forest Officer, Shimoga District, is granted privilege leave of absence for one month, with effect from the 10th April 1904 or such other date as he may avail, himself of the same. Mr. J. J. Monteiro, Assistant Conservator of Forests, Shimoga Range, will be in charge of the duties of the District Forest Officer, Shimoga District, during the absence of Mr. Venkatnarnappa on leave or until further orders.



## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

20th May 1904.—No. 542—75-7-F.—Mr. T. A. Hauxwell, Conservator of Forests, 2nd grade, in charge of the Northern Circle, Upper Burma, is granted privilege leave for three months, combined with furlough for six months, with effect from the 12th May 1904.

Mr. H. Slade, Conservator, 3rd (officiating 2nd, grade, is transferred from the Pegu Circle and appointed to the charge of the Northern Circle, of which he relieved Mr. T. A. Hauxwell on the afternoon of the 11th May 1904.

Mr. J. Copeland, Deputy Conservator, 1st grade, Upper Burma, is appointed to officiate as Conservator, 3rd grade, in charge of the Pegu Circle, of which he relieved Mr. H. Slade on the afternoon of the 11th May 1904.

28th May 1904 —No. 569—174-2 F.—Mr. E. E. Fernandez, Conservator of Forests, 1st grade, in charge of the Berar Circle, Central Provinces, is granted privilege leave for fifty-two days, with effect from the 20th June 1904.

6th June 1904 —No. 619—185-2-F.—With reference to the Notification of this Department, No. 969—57-34-F., dated the 12th September 1901, the services of Mr. C. S. Rogers, Extra Assistant Conservator of Forests, Burma have been permanently placed at the disposal of His Majesty's Colonial Office for employment in Trinidad, with effect from the 24th March.

23rd June 1904 —No. 690—203-1-F.—With reference to the notification of this Department No. 1488—189-7-F., dated the 29th December 1903, the services of Mr. H. C. Walker, Assistant Conservator of Forests, are replaced at the disposal of the Government of Burma.

### 2.—MADRAS GAZETTE.

26th May 1904.—Sheik Rahmatullah Sahib, Ranger, 5th grade, Kurnool district, is granted leave on medical certificate for three months from date of relief.

30th May 1904.—No. 230.—The following appointments are made :—

(1) Mr. Bernard Henry Barlow-Pool, to be Assistant Conservator of Forests, 1st grade, without prejudice to his acting appointment as Deputy Conservator of Forests, 4th grade, with effect from 10th February 1904, *vice* Mr. J. L. MacCarthy O'Leary.

*Note.*—This supersedes so much of Notification No. 132, published at page 361 of Part I of the *Fort St. George Gazette*, dated 5th April 1904, as relates to Mr. Barlow-Poole's appointment as Assistant Conservator of Forests, 1st grade.

(2) Mr. William Aitchison to be Assistant Conservator of Forests, 1st grade, without prejudice to his acting appointment as Deputy Conservator of Forests, 4th grade, with effect from 17th February 1904, the date on which Mr. Gordon Hadfield retired from service.

(3) Mr. Robert Daniel Richmond to act as Deputy Conservator of Forests, 4th grade, during the absence of Mr. H. F. Arbuthnot on privilege leave with effect from the date on which Mr. A. W. Lushington returns from leave.

(4) Mr. Charles Mortimer Hodgson to act as Deputy Conservator of Forests, 2nd grade, during the absence of Mr. P. M. Lushington on privilege leave until the date on which Mr. A. W. Lushington returns from leave.

(5) Mr. Arthur Bushe Jackson to act as Deputy Conservator of Forests, 2nd grade, during the absence of Mr. P. M. Lushington on privilege leave with effect from the date on which Mr. A. W. Lushington returns from leave.

(6) Mr. Henry Tireman to act as Deputy Conservator of Forests, 3rd grade, *vice* No. (4).

(7) Mr. Hugo Francis Andrew Wood to act as Deputy Conservator of Forests, 3rd grade, *vice* No. (5).

1st June 1904.—No. 228.—In modification of the leave granted him in notification No. 48, published at page 146 of Part I of the *Port St. George Gazette*, dated 2nd February 1904, Mr. Frank Adrian Lodge, Acting Conservator of Forests, Northern Circle, is granted privilege leave for three months with effect from the date of his relief by Mr. A. W. Lushington, and in continuation thereof special leave on urgent private affairs for three months.

2nd June 1904.—*Appointment*.—M. Velu Pillai of Trivandrum, holding Dehra Dun Ranger's certificate of 1904, is appointed to be Ranger, 6th grade, on probation for six months from date of joining and posted to South Coimbatore.

8th June 1904.—No. 239.—Mr. P. M. Lushington, District Forest Officer, North Coimbatore, will be considered to have been in charge of the District Forest Office, South Coimbatore, in addition to his own duties from 23rd February to 9th March 1904.

8th June 1904.—*Leave*.—Mr. J. P. Nazareth, Ranger, 5th grade, North Coimbatore division, is granted privilege leave on medical certificate under article 260 of the Civil Service Regulations, from 14th May to 18th June 1904 (both days inclusive).

18th June 1904.—No. 249.—Under article 260 of the Civil Service Regulations, Mr. Percy Manners Lushington, Deputy Conservator of Forests, is granted an extension by one month of the privilege leave for two months granted him in Notification No. 145, published at page 381, Part I, of the *Port St. George Gazette*, dated 12th April 1904.

### 3.—BOMBAY GAZETTE.

14th May 1904.—No. 757.—Mr. W. A. Wallinger, Divisional Forest Officer, Kolaba, handed over and Mr. J. H. Irani, acting Extra-Assistant Conservator of Forests, received charge of the Sub-Divisional Forest Office, Kolaba, on the forenoon of the 19th April 1904.

30th May 1904.—No. 587.—Mr. Gopal Manjhanath Bhatkal, Extra-Assistant Conservator of Forests, handed over and Mr. Balvant Gunesh Deshpande, Extra-Assistant Conservator of Forests, received charge of the Sub-Division Forest Office, East Khandesh, on the forenoon of the 30th April 1904.

9th June 1904.—No. 704.—Messrs. D. N. Damale, 'Extra-Assistant Conservator of Forests, 4th grade, and A. G. Edie, Deputy Conservator of Forests, 4th grade, respectively delivered over and received charge of the Divisional Forest Office, Nasik, on the afternoon of the 28th May 1904.

9th June 1904.—No. 1388.—Mr. A. W. W. Mackie, I.C.S., handed over and Mr. J. K. N. Kabraji, acting Collector, received charge of the Ratnagiri Forest Division on the forenoon of 2nd June 1904.

16th June 1904.—No. 1516.—Mr. G. R. Mane, Extra-Assistant Conservator of Forests, who was granted thirty days' privilege leave, handed over charge of the Sub-Divisional Forest Office, Belgaum, to Mr. O. H. L. Napier, the Divisional Forest Officer, on the afternoon of the 14th April, and on return from leave reported himself for duty to the Divisional Forest Officer on the forenoon of the 15th May 1904.

## 4.—BENGAL GAZETTE.

27th May 1904.—No. 1033 T.R.—The services of Mr. B. B. Osmaston, F. C. S., Deputy Conservator of Forests, are placed at the disposal of the Government of India in the Revenue and Agricultural Department, with effect from the 14th July 1904, for duty in the Andamans.

21st June 1904.—No. 1492 T.R.—The services of Mr. E. P. Stebbing, Deputy Conservator of Forests, are placed at the disposal of the Government of India, Department of Revenue and Agriculture, for employment as Forest Entomologist, with effect from the date on which he returns from furlough.

25th June 1904.—No. 1589.—R. T. Consequent on the placing of the services of Mr. B. B. Osmaston, F. C. S., Deputy Conservator of Forests, at the disposal of the Government of India, in Notification No. 1033 T.R., dated the 27th May 1904, the following appointments and transfers are ordered:—

Mr. H. K. Robinson, Assistant Conservator of Forests, in charge of the Direction Division and Personal Assistant to the Conservator of Forests, Bengal, to relieve Mr. Osmaston of the charge of the Darjeeling Division and to continue in charge of his present duties until relieved of the latter.

Mr. P. J. Draper, Extra-Assistant Conservator of Forests, on return from the privilege leave granted in Notification No. 1276 For., dated 29th February 1904, to relieve Mr. J. L. Baker, Officiating Deputy Conservator of Forests, of the charge of the Sonthal Parganas Division.

Mr. J. L. Baker, on being relieved of the charge of the Sonthal Parganas Division, to relieve Mr. H. K. Robinson of the charge of the Direction Division and of the duties of Personal Assistant to the Conservator.

27th June 1904.—No. 1613 T.R.—Consequent on the deputation to Foreign Service of Mr. A. H. Mee, Extra-Assistant Conservator of Forests, 1st grade, the following promotion is ordered with effect from the 20th May 1904:—

Mr. W. Breakey, Forest Ranger, 4th grade, to be Extra-Assistant Conservator of Forests, 4th grade, sub. *pro tem*.

27th June 1904.—No. 1614 T. R.—Babu Ashutosh Chuckerbutty, Forest Ranger, 1st grade, is appointed to officiate as Extra-Assistant Conservator of Forests, 4th grade, with effect from the 9th March 1904, *vice* Mr. E. E. Shane, Extra Assistant Conservator of Forests, on furlough, or until further orders.

## 5.—UNITED PROVINCES GAZETTE.

17th June 1904.—No. 2350-II/207-1904.—Lala Parmeshwari Din, Extra-Assistant Conservator of Forests, furlough for one year in combination with the privilege leave granted to him in Notification No. 1879-II/207-1904, dated 16th May 1904.

21st June 1904.—No. 2422-II/33-1904.—Lala Har Swarup, Extra-Assistant Conservator of Forests, on return from leave, to be attached to the Naini-Tal Forest Division of the Central Circle.

## 6.—PUNJAB GAZETTE.

25th May 1904.—No. 229.—Lala Jwala Prasad, Extra-Assistant Conservator of Forests, and Mr. C. F. Rossiter, Extra Deputy Conservator of Forests, respectively, made over and received charge of the Montgomery Forest Division on the afternoon of the 25th April 1904, consequent on the former proceeding on 33 days' privilege leave.

Mr. Rossiter will hold charge of the Montgomery Division in addition to the Mooltan Division.



15th June 1904.—No. 252 A.-L. No. 8.—Mr. C. G. Trevor, Assistant Conservator of Forests, made over charge of the Direction Division to Mr. E. G. Chester, Conservator of Forests, on the afternoon of the 1st June 1904.

From the same date Mr. Trevor is temporarily attached to the Chamba Forest Division.

21st June 1904.—No. 273—A.-L. No. 9.—Mr. C. G. Trevor, Assistant Conservator of Forests, passed the following prescribed examinations on the dates noted against them :—

|                          |    |    |                |
|--------------------------|----|----|----------------|
| Forest Law               | .. | .. | 12th May 1904. |
| * Land Revenue           | .. | .. | 11th May 1904. |
| * Procedure and Accounts | .. | .. | 21st May 1904. |

#### 7.—CENTRAL PROVINCES GAZETTE.

30th April 1904.—No 1.—On return from privilege leave granted him by Department Order No. 1659, dated the 21st March 1904, Mr. Dhanjisha Nasarwanji Avasia, Forest Ranger, is posted to the Raipur Division.

26th May 1904.—No. 3.—In consequence of the reversion of Mr. Dhanjisha Nasarwanji Avasia to his permanent appointment of Ranger, 1st grade, the following reversions among Rangers will take place with effect from the 1st March 1904 :—

| Name.                           | Present grade.   | Grade to which reverted.              |
|---------------------------------|--|---------------------------------------|
| Mr. F. J. Langhorne.            | Ranger, 1st grade, sub.<br><i>pro tem.</i> (on deputa-<br>tion). | Ranger, 2nd grade (on<br>deputation). |
| Mr. N. C. Chatterji.            | Ranger, 1st grade, sub.<br><i>pro tem.</i>                       | Ranger, 2nd grade.                    |
| Pandit Ghansham Par-<br>shad.   | Ranger, 2nd grade, sub.<br><i>pro tem.</i>                       | Ranger, 3rd grade.                    |
| Pandit Jairam Raghunath.        | Ranger, 3rd grade, sub.<br><i>pro tem.</i>                       | Ranger, 4th grade.                    |
| Pandit Vishnu Vasudeo<br>Sathe. | Ranger, 4th grade, sub.<br><i>pro tem.</i>                       | Ranger, 5th grade.                    |

30th May 1904.—No. 45.—With the approval of the Officiating Chief Commissioner, Central Provinces, Sukhdeo Rai, Deputy Ranger, 1st grade, is appointed Ranger, 6th grade, sub. *pro tem.*, with effect from the 1st May 1904.

4th June 1904.—No. 27.—In Departmental Order No. 13, dated the 6th May 1904, for "Shaikh Jamal" read "Raghunath Narain."

9th June 1904.—No. 3425.—Mr. L. Gisborne Smith, Deputy Conservator of Forests, 1st grade, has been permitted by the Secretary of State for India to retire from service on an invalid pension with effect from the 18th October 1903.

9th June 1904.—No. 29.—The extraordinary leave without allowances granted to 2nd grade Deputy Ranger Bhairon Singh, by Departmental

\*Passed with credit.

Orders Nos. 11, 76, 63 and 79, dated respectively the 11th May 1902, 29th October 1902, 15th September 1903, and 4th November 1903, is extended by one year.

17th June 1904.—No. 3577.—Privilege leave for one month and 15 days, under Articles 246 and 260 of the Civil Service Regulations, is granted to Mr. C. Somers-Smith, Deputy Conservator of Forests, in charge of the Saugor Forest Division, with effect from the 1st June 1904, or the subsequent date on which he may avail himself of it.

Mr. J. J. Hobday, Extra-Assistant Conservator of Forests in charge of the Sambalpur Forest Division, is transferred to the charge of the Saugor Forest Division, during the absence of Mr. C. Somers-Smith, or until further orders.

22nd June 1904.—No. 3684.—Mr. V. G. Morgan, Assistant Conservator of Forests, is transferred from Mandla to Jubbulpore and is attached to the Direction Division as Personal Assistant to the Conservator of Forests, Northern Circle, Central Provinces.

23rd June 1904.—No. 3707.—On return from the six months' combined leave granted him by Order No. 5536, dated the 8th December 1903, Mr. Faiz Bakhsh, Extra-Assistant Conservator of Forests, is posted to the charge of the Sambalpur Forest Division, with effect from the forenoon of the 10th instant.

#### 8.—BURMA GAZETTE.

11th May 1904.—No. 14.—With reference to Revenue Department Notification No. 179 (Forests), dated the 30th April 1904, Mr. J. Copeland, Deputy Conservator of Forests, made over, and Mr. H. H. Forteach, Deputy Conservator Forests, received charge of the Mandalay Forest Division on the afternoon of the 9th May 1904.

11th May 1904.—No. 219.—Under the provisions of Articles 233, 246, 260 and 338(a) of the Civil Service Regulations, Mr. D. H. Allan, Extra-Assistant Conservator of Forests, is granted privilege leave for one month and twenty-three days and furlough in continuation thereof for one year with effect from the 12th May 1904, or the subsequent date on which he may avail himself of the privilege leave.

18th May 1904.—No. 14.—With reference to Revenue Department Notification No. 212 (Forests), dated 13th May 1904, Mr. W. T. T. McHarg, Deputy Conservator of Forests, availed himself of the combined privilege leave and furlough granted therein on the forenoon of the 10th May 1904.

18th May 1904.—No. 15.—With reference to Revenue Department Notification No. 213 (Forests), dated 13th May 1904, Mr. H. W. A. Watson, Deputy Conservator of Forests, assumed charge of the Toungoo Division, relieving Mr. W. T. T. McHarg, Deputy of Conservator Forests, on the forenoon of the 10th May 1904.

19th May 1904.—No. 3.—With reference to Revenue Department Notification No. 209 (Forests), dated the 13th May 1904, Mr. C. W. Doveton, Deputy Conservator of Forests, made over, and Mr. C. B. Dun, Deputy Conservator of Forests, received charge of the Lower Chindwin Division on the forenoon of the 16th May 1904.

20th May 1904.—No. 15.—With reference to Revenue Department Notification No. 184 (Forests), dated 5th May 1904, Mr. F. H. Todd, Deputy Conservator of Forests, assumed charge of his special duties in the Direction Division, Southern Circle, on the forenoon of the 16th April 1904 and relinquished charge of the same on the forenoon of the 22nd April 1904.

20th May 1904.—No. 16.—With reference to Revenue Department Notification No. 145 (Forests), dated 2nd April 1904, Mr. R. C. A. Pinder, Extra-Assistant Conservator of Forests, relinquished charge of the Shweli subdivision, Ruby Mines Division, on the forenoon of the 11th May 1904, and assumed charge of his duties in the Ruby Mines Division on the

forenoon of the 12th May 1904.

23rd May 1904.—No. 16.—With reference to Revenue Department Notification No. 129 (Forests), dated the 11th May 1904, Mr. D. H. Allan, Extra-Assistant Conservator of Forests and Personal Assistant to the Conservator of Forests, Tenasserim Circle, availed himself of the combined privilege leave and furlough granted therein on the forenoon of the 12th May 1904.

27th May 1904.—No. 17.—With reference to Revenue Department Notification No. 186 (Forests), dated the 7th May 1904, Mr. S. Carr, Deputy Conservator of Forests, made over, and Mr. H. L. P. Walsh, Deputy Conservator of Forests, received charge of the Pyinmana Forest Division on the afternoon of the 24th May 1904.

27th May 1904.—No. 237.—Mr. F. A. Leete, Deputy Conservator of Forests, was placed on special duty in the Minbu Forest Division from the 4th March to the 17th March 1904, both days inclusive.

27th May 1904.—No. 238.—The following alterations in rank are ordered in the Forest Department:—

With effect from the 1st March 1904, consequent on the transfer to Burma of Mr. F. A. Leete, Deputy Conservator of Forests, 3rd grade—

Mr. G. K. Parker, Deputy Conservator, 4th grade, *prov. sub.* (officiating 3rd grade), to revert to his *prov. sub.* appointment.

Mr. L. C. Davis, Assistant Conservator, 1st grade, *prov. sub.* (officiating Deputy Conservator, 4th grade), to revert to his *prov. sub.* appointment.

28th May 1904.—No. 12.—With reference to Revenue Department Notification No. 210 (Forests), dated the 13th May 1904, Mr. C. W. Doveton, Deputy Conservator of Forests, assumed charge of the Promé Forest Division on the forenoon of the 26th May 1904, relieving Mr. A. H. M. Lawson, Deputy Conservator of Forests.

30th May 1904.—No. 240.—On return from duty in the Andaman Islands, Mr. H. C. Walker, Assistant Conservator of Forests, is appointed to be Personal Assistant to the Conservator of Forests, Tenasserim Circle.

30th May 1904.—No. 243.—In this Department Notification No. 176, dated the 27th April 1904, for "21st April 1904" in the third line read "30th April 1904."

30th May 1904.—No. 244.—In this Department Notification No. 177, dated the 27th April 1904, for "21st April 1904" in the third line read "14th May 1904."

31st May 1904.—No. 249.—Mr. P. E. Plunkett, Extra-Assistant Conservator of Forests, is posted to the charge of the South Tharrawaddy Forest subdivision, *vice* Mr. J. C. Hopwood, Assistant Conservator of Forests, transferred.

31st May 1904.—No. 250.—On relief by Mr. Plunkett, Mr. J. C. Hopwood, Assistant Conservator of Forests, is transferred from the South Tharrawaddy Forest subdivision to the charge of the Toungoo Forest subdivision.

31st May 1904.—No. 251.—Mr. R. C. A. Pinder, Extra-Assistant Conservator of Forests, is transferred from the Ruby Mines Forest Division to the charge of the Railway Revenue Range in the Toungoo Forest Division.

31st May 1904.—No. 252.—Maung Tha Ka Do, Extra-Assistant Conservator of Forests, is transferred from Pegu to the charge of the North Tharrawaddy Forest subdivision, *vice* Mr. B. E. Marsden, Assistant Conservator of Forests, proceeding on leave.

31st May 1904.—No. 13.—With reference to Revenue Department Notification No. 189 (Forests), dated 4th May 1904, Mr. R. E. Marsden, Assistant Conservator of Forests, made over, and Mr. W. R. French, Extra-Assistant Conservator of Forests, received, charge as a temporary measure of the North Tharrawaddy subdivision on the afternoon of the 26th May 1904.

7th June 1904.—No. 14.—With reference to Revenue Department Notification No. 211 (Forests), dated the 13th May 1904, Mr. A. H. M. Lawson, Deputy Conservator of Forests, assumed charge of the Bassein-Myaungmya Forest Division on the afternoon of the 3rd June 1904, relieving Mr. L. C. Davis, officiating Deputy Conservator of Forests, proceeding on leave.

8th June 1904.—No. 20.—With reference to Revenue Department Notification No. 240 (Forests), dated the 30th May 1904, Mr. H. C. Walker, officiating Deputy Conservator of Forests, reported himself for duty as Personal Assistant to the Conservator of Forests, Tenasserim Circle, on the afternoon of the 30th May 1904.

8th June 1904.—No. 277.—Under the provisions of Articles 246, 260 and the Note to Article 251 of the Civil Service Regulations, privilege leave for three months and fifteen days is granted to Mr. L. C. Davis, officiating Deputy Conservator of Forests, with effect from the date on which he may avail himself of it.

14th June 1904.—No. 21. (CORRIGENDUM).—In this Department Notification No. 15, dated the 18th May 1904, published at page 369, Part IV of the *Burma Gazette*, dated the 21st May 1904, for the word "forenoon" in the last line, read "afternoon."

#### 9.—ASSAM GAZETTE.

18th June 1904.—No. 5359G.—With effect from the 24th April 1904, in consequence of the departure on leave of Mr. H. G. Young, Deputy Conservator of Forests, 2nd grade, sub. *pro tem*—

Mr. E. M. Coventry, Deputy Conservator of Forests, 3rd grade, sub. *pro tem*., on leave, and with him Mr. W. F. Perrée, Officiating Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservators of Forests, 2nd grade.

Mr. A. R. Dicks, Deputy Conservator, 4th grade, on leave, and with him Mr. W. A. R. Doxat, Deputy Conservator of Forests, 4th grade, sub. *pro tem*., to officiate as Deputy Conservators of Forests, 3rd grade.

#### 10.—MYSORE GAZETTE.

31st May 1904.—No. 896—10031.—The one month's privilege leave of absence sanctioned in Notification No. 809—9210, dated 7th May 1904, to Mr. M. Venkatnarnappa, Deputy Conservator of Forests, Shimoga, under Article 118 of the Mysore Service Regulations, is hereby extended by two months. The present arrangement under which Mr. Monteiro, Assistant Conservator of Forests, is in charge of the duties of the District Forest Officer of Shimoga, will continue during Mr. Venkatnarnappa's further leave or until further orders.

6th June 1904.—No. 907—10136.—Under Article 218 of the Mysore Service Regulations, Mr. S. A. Bapu Rao, Deputy Conservator of Forests, Kolar District, is granted leave on medical certificate for four weeks, with effect from the 26th May 1904.

7th June 1904.—No. 912—10165.—Mr. M. Frinivasa Rao, Sub-Assistant Conservator of Forests, Shimoga District, having been pronounced by the District Surgeon to be fit for duty in the Maidan, he is recalled to duty from the 28th May 1904, from the leave granted to him in Notification No. 747—7918, dated the 28th March 1904, and is posted to Kolar for charge of the District Forest Office during the absence of Mr. S. A. Bapu Rao, on leave, or until further orders. The unexpired portion of the leave is cancelled.



## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

30th June 1904.—No. 720—174 4-F.—The following arrangements are made, with effect from the 20th June 1904, during the absence of Mr. E. E. Fernandez, Conservator of Forests, 1st grade, Berar Circle, Central Provinces, on the leave granted to him in the Notification of this Department No. 569-F. dated the 26th May 1904, or until further orders:—

(i) Mr. E. S. Carr, Officiating Conservator of Forests, 2nd grade, to act in the 1st grade.

(ii) Mr. R. M. Williamson, Officiating Deputy Conservator of Forests, 2nd grade, to hold charge of the current duties of the Office of the Conservator of the Berar Forest Circle in addition to his own.

8th July 1904.—No 775—213-2-F.—Mr. A. G. Hobart-Hampden, Conservator of Forests, School Circle, United Provinces, and Director of the Imperial Forest School, Dehra Dun, is granted privilege leave for three months, with effect from 27th July 1904. From the same date the following arrangements are made during Mr. Hobart-Hampden's absence, or until further orders:—

Mr. H. Jackson, Officiating Conservator of Forests, 4th grade, and Deputy Director of the Imperial Forest School, Dehra Dun, to officiate as Director of the Imperial Forest School and to hold charge of the School Circle, United Provinces.

Mr. R. McIntosh, Instructor, Imperial Forest School, Dehra Dun, to officiate as Deputy Director of the Imperial Forest Sch<sup>o</sup>l.

27th June 1904.—No. 2364—I-A—His Excellency the Viceroy and Governor-General is pleased to confer the title of Rai Bahadur as a personal distinction upon—

Babu Karuna Nidhan Mukerjee, Extra Deputy Conservator of Forests, in the United Provinces.

### 2.—MADRAS GAZETTE.

27th June, 1904.—*Extension of Leave.*—The six weeks and ten days' privilege leave granted to Forest Ranger Mr. A. F. X. Saldanha, as published on page 588 of *Fort St. George Gazette*, dated 5th April 1904, of Part II, is extended by three days.

5th July 1904.—*Cancellation of Appointment.*—The notification published on page 874 of Part II of *Fort St. George Gazette*, dated 14th June 1904 relative to the appointment of M. Velu Pillai of Trivandrum as Ranger 6th grade, on probation for six months, is cancelled.

5th July 1904.—*Extension of Leave.*—The six weeks' privilege leave, under article 280 of the Civil Service Regulations, granted to Mr. A. F. X. Saldanha, Ranger, 2nd grade, sub. *pro tem*, Nilgiris, as per notification printed on page 588, Part II of *Fort St. George Gazette*, dated 5th April 1904, is extended by ten days.

8th July 1904.—*Transfer.*—The Board resolves to order the following transfer:—

Mr. J. A. Daly, Extra Assistant Conservator of Forests, 4th grade, from the Central to the Southern Circle.

9th July 1904.—*Leave*.—M. R. Ry. V. Kalyararama Aiyar, Ranger, Ganjam District, is granted privilege leave for two months from date of relief.

11th July 1904.—*Extension of Leave*.—The privilege leave from 14th May to 18th June 1904 granted to J. P. Nazareth, Ranger, 5th grade, North Coimbatore, as per notification published on page 896 of Part II of *Fort St. George Gazette*, dated 12th June 1904, is commuted into leave on medical certificate under article 336 of the Civil Service Regulations, and the same extended by three months.

### 3.—BOMBAY GAZETTE.

25th June 1904.—No. 1786.—Mr. J. H. Irani, Acting Extra Assistant Conservator of Forests, 4th grade, delivered over and Mr. N. D. Satarawala, Extra Assistant Conservator of the Forests, 1st grade, received charge of the Sub-Divisional Forest office, Kolaba, on the afternoon of the 10th June 1904.

29th June 1904.—No. 4917.—Mr. O. H. L. Napier, Divisional Forest Officer, Belgaum, passed an examination in Kanarese according to the Higher Standard on the 16th June 1904.

Mr. Dinkar Narayan Damle, Extra Assistant Conservator of Forests, Nasik, passed an examination in Gujarati according to the Higher Standard on the 16th June 1904.

8th July 1904.—No. 5224.—Gradation List of Conservators, Deputies, Assistants, Extra Deputy and Extra Assistant Conservators, as it stood on the 1st May 1904.

NOTE.—Professionally trained officers are indicated by an asterisk before their names.—*vide* G. R. R. D., No. 5296, dated 24th July 1896.

| Appointment.                               | No | Holder of the Substantive Appointment. | Cause of Vacancies.                            | Holder of Acting Appointment in Grade. | Date of Appointment to act in Grade. | REMARKS.  |
|--|----|--|--|--|--------------------------------------|---|
| 1  | 2  | 3                                      | 4  | 5                                      | 6                                    | 7   |
| <b>Conservators—</b>                       |    |  |  |  |                                      |   |
| First Grade : 1 appointment on Rs. 1,600.  | 1  | Mr. T. B. Fry                          | ...  | ...                                    | ...                                  |   |
| Second Grade : 1 appointment on Rs. 1,400. | 1  | *Mr. W. A. Talbot.                     | On furlough for 18 months from 20th June 1903. | ...                                    | ...                                  |   |
| Third Grade : 1 appointment on Rs. 1,200   | 1  | *Mr. F. Gleadow                        | On furlough for 15 months from 22th June 1903. | Mr. H. Murray.<br>Mr. G. P. Millett.   | 19th October 1903.<br>29th May 1902. | (Excess in this grade met by a vacancy in the Second grade of Conservators. |
| <b>Deputy Conservators—</b>                |    |  |  |  |                                      |   |
| First Grade: 2 appointments on Rs 900.     | 1  | Mr. W. G. Betham.                      | ...  | Mr. T. R. D. Bell.                     | 29th June 1903.                      |   |
|  | 2  | *Mr. H. Murray                         | Acting Conservator.                            | ..                                     | ...                                  |   |

| Appointment.                                   | No. | Holder of the Substantive Appointment.             | Cause of Vacancies.                                 | Holder of Acting Appointment in Grade. | Date of Appointment to act in Grade. | Remarks.   |
|--|-----|--|---|--|--------------------------------------|--|
| 1  | 2   | 3  | 4   | 5                                      | 6                                    | 7  |
| Second Grade:<br>4 appointments on<br>Rs. 800. | 1   | Mr. A. D. Wilkins                                  | ...   | Mr. G. M. Ryan.                        | 20th March 1903.                     |  |
|  | 2   | * Mr. H. W. Keys.                                  | ...   | Mr. E. G. Oliver.                      | 18th May 1903.                       |  |
|  | 3   | * Mr. G. P. Willett                                | Acting Conservator.                                 | ..                                     | ...                                  |  |
|  | 4   | * Mr. T. R. D. Bell.                               | Acting 1st Grade Deputy Conservator.                | ...                                    | ...                                  |  |
| Third Grade:<br>7 appointments on<br>Rs. 650.  | 1   | Mr. G. M. Ryan                                     | Acting 2nd Grade Deputy Conservator.                | Mr. W. E. Copleston.                   | 9th April 1902.                      |  |
|  | 2   | * Mr. F. G. Oliver.                                | Do.   | Mr. D. A. Thomson.                     | 11th April 1903.                     |  |
|  | 3   | * Mr. L. S. Gammston.                              | ...   | ...                                    | ...                                  |  |
|  | 4   | (Temporary Pilot.)                                 | ...   | ...                                    | ...                                  |  |
|  | 5   | * Mr. W. F. D. Fisher.                             | ...   | ...                                    | ...                                  |  |
|  | 6   | * Mr. O. H. L. Napier                              | ...   | ...                                    | ...                                  |  |
|  | 7   | * Mr. G. R. Duxbury                                | ...   | ...                                    | ...                                  |  |
| Fourth Grade:<br>6 appointments on<br>Rs. 550. | 1   | * Mr. W. E. Copleston.                             | Acting 2nd Grade Deputy Conservator                 | Mr. P. S. Thomson.                     | 15th November 1901.                  |  |
|  | 2   | * Mr. D. A. Thomson.                               | Do.   | Mr. C. S. McKenzie.                    | 2nd March 1903.                      |  |
|  | 3   | * Mr. J. Hodgson.                                  | ...   | Mr. G. E. Marjoribanks.                | 17th April 1904.                     | Without acting allowance.  |
|  | 4   | * Mr. A. G. Edie.                                  | On privilege leave for 6 weeks from 17th April 1904 | ...                                    | ...                                  |  |
|  | 5   | * Mr. B. M. Hodgson.                               | ...   | ...                                    | ...                                  |  |
| Assistant Conservators -                       | 6   | Pilot  | ...   | ...                                    | ...                                  |  |
| First Grade:<br>5 appointments on<br>Rs. 450.  | 1   | * Mr. R. S. Pearson.                               | Acting 4th Grade Deputy Conservator.                | Mr. J. D. Maitland-Kirwan.             | 19th March 1904.                     |  |
|  | 2   | * Mr. C. S. McKenzie.                              | Do. ...   | Vacant ..                              | 7th January 1902.                    |  |
|  | 3   | Mr. G. E. Marjoribanks.                            | Do. ...   | Vacant ...                             | 17th April 1904.                     | Without acting allowance (Mr. D. N. Dangle in charge in addition). |
|  | 4   | * Mr. H. L. Newman.                                | -   | ...                                    | ...                                  |  |
|  | 5   | Permanently transferred to the Provincial Service. | ...   | ...                                    | ...                                  |  |



| Appointment.                                   | No. | Holder of the Substantive Appointment.                    | Cause of Vacancies.                                   | Holder of Acting Appointment in Grade. | Date of Appointment to act in Grade. | Remarks. |
|--|-----|---|---|--|--------------------------------------|----------|
| 1  | 2   | 3   | 4   | 5                                      | 6                                    | 7        |
| Second Grade:<br>4 appointments on<br>Rs. 350. | 1   | * Mr. J. D. Maitland-Kirwan.                              | Acting 1st Grade Assistant Conservator.               | Vacant ...                             | 19th March 1904.                     |          |
|  | 2   | * Mr. P. E. Aitchison.                                    | ...   | ...                                    | ..                                   | .        |
|  | 3   | Vacant ...  | ...   | ...                                    | ...                                  |          |
|  | 4   | <i>Permanently transferred to the Provincial Service.</i> | ...   | ...                                    | ...                                  |          |
| Extra Deputy Conservators—                     |     |   |   |  |                                      |          |
| Third Grade: 1 appointment on Rs. 500.         | 1   | Mr. Bustamji H. Madan, L. C. E.                           | ...   | ...                                    | ...                                  |          |
| Fourth Grade: 1 appointment on Rs. 450.        | 1   | Mr. Shomkiram Pribdas.                                    | ...   | ...                                    | ...                                  |          |
| Extra Assistant Conservators—                  |     |   |   |  |                                      |          |
| First Grade:<br>5 appointments on<br>Rs. 350.  | 1   | Mr. W. A. Wallinger.                                      | ...   | ...                                    | ...                                  |          |
|  | 2   | Mr. Haripad Mitra, L. C. E.                               | ...   | ...                                    | ...                                  |          |
|  | 3   | <i>Mr. Nanabhai Dadabhai Sarawala, L. C. E.</i>           | On privilege leave for 2 months from 11th April 1904. | ...                                    | ...                                  |          |
|  | 4   | Mr. Ganesh Sakharam Hinge.                                | ...   | ...                                    | ...                                  |          |
|  | 5   | Mr. Arthur Charles Robinson, L. C. E.                     | ...   | ...                                    | ..                                   |          |
| Second Grade:<br>5 appointments on<br>Rs. 300. | 1   | Mr. Balvant Ganesh Deshpande.                             | ...   | ...                                    | ...                                  |          |
|  | 2   | Mr. V. D. P. Rebelro, L. C. E.                            | ...   | ..                                     | ...                                  |          |
|  | 3   | Mr. Ardeshar Nasarwanji Master, L. C. E.                  | ...   | ..                                     | ...                                  |          |
|  |     | <i>Mr. Bhagvandas Harkisandas Dalal, L. C. E.</i>         | Services lent to Rajpipla State from 20th May 1897.   | ...                                    | ...                                  |          |
|  | 4   | Mr. Dattatraya Manjunath Bijur.                           | ...   | ...                                    | ...                                  |          |
|  | 5   | Mr. Chunilal Gulabchand Dalia, L. C. E.                   | ...   | ...                                    | ..                                   |          |

| Appointment.                                   | No. | Holder of the Substantive Appointment. | Cause of Vacancies. | Holder of Acting Appointment in Grade. | Date of Appointment to act in Grade. | Remarks.   |
|--|-----|--|---------------------|--|--------------------------------------|--|
| 1  | 2   | 3                                      | 4                   | 5                                      | 6                                    | 7  |
| Third Grade:<br>6 appointments on<br>Rs. 250.  | 1   | Mr. Ganpat Jayavant Bege               | ...                 | ...                                    | ...                                  |  |
|  | 2   | Mr. Abdul Rbdul Khajbaksh.             | ...                 | ...                                    | ...                                  |  |
|  | 3   | Mr. Haribar Anant Narkarni, L.C.E.     | ...                 | ...                                    | ...                                  |  |
|  | 4   | Mr. Ganpat Ramji Mane.                 | ...                 | ...                                    | ...                                  |  |
|  | 5   | Mr. Govind Ramchandra Takle.           | ...                 | ...                                    | ...                                  |  |
|  | 6   | Mr. Bajibhai Jadhavbhai Patel, L.C.E.  | ...                 | ...                                    | ...                                  |  |
| Fourth Grade:<br>5 appointments on<br>Rs. 200. | 1   | Mr. Gopal Manjunath Bhatkal,           | ...                 | Mr. Jahangir Hormasji Irani.           | 19th April 1904.                     | Also acted as 4th Grade Extra Assistant Conservator with acting allowance up to 11th April 1904. |
|  | 2   | Mr. Lakshman Shamrao Kopplkar.         | ...                 | ...                                    | ...                                  |  |
|  | 3   | Krishnaji Balvant Gokhall, I.C.E.      | ...                 | ...                                    | ...                                  |  |
|  | 4   | Mr. Metharam Deval Jagtani.            | ...                 | ...                                    | ...                                  |  |
|  | 5   | Mr. Dinkar Narayan Dangle.             | ...                 | ...                                    | ...                                  |  |

NOTE.—Excess in the last grade of Extra Assistant Conservators is covered by an acting vacancy in the higher grade.

- (i) The two acting vacancies in the 4th Grade of Extra Assistant Conservators ceased (1) from 21st April and (2) from 30th April 1904.
- (ii) There was an acting vacancy carrying no acting allowance in the 4th Grade of Extra Assistant Conservators, from 11th to 18th April 1904 (Mr. Wallinger in charge in addition).

4.—BENGAL GAZETTE.

5th July 1904.—No. 2678A.—The Report of the Central Examination Committee having been received, the result of the First Half-yearly Departmental Examination of Assistant Magistrates and others, held on the 2nd May 1904 and the two following days, is published for general information :—

IV.—FOREST OFFICERS.

The Officer named below has passed in the subject mentioned against him :—

|                   |    |    |                      |
|-------------------|----|----|----------------------|
| Mr. W. Breakey .. | .. | .. | Land Revenue Systems |
|                   |    |    | " With credit."      |

23rd July 1904.—No. 2907.—Babu Lalit Mohan Sen, Extra Assistant Conservator of Forests, attached to the Chittagong Forest Division, is granted privilege leave for one month, under article 260 of the Civil Service Regulations, with effect from the 20th July 1904, or any subsequent date on which he may avail himself of it.

25th July 1904.—No. 2942.—Privilege leave for two months, under article 260 of the Civil Service Regulations, is granted to Mr. E. R. Comber, Extra Assistant Conservator of Forests, attached to the Sunderbans Forest Division, with effect from the 1st August 1904, or any subsequent date on which he may avail himself of it.

25th July 1904.—No. 2942.—Mr W. Breakey, Extra Assistant Conservator of Forests, sub. *pro tem.*, now in charge of the Kolhan Range, Singhbhum Division, is transferred as an attached officer to the Sunderbans Divisions, during Mr. E. R. Comber's absence on leave, or until further orders.

5.—UNITED PROVINCES GAZETTE.

14th July 1904.—No. 2732.—II/33-1904.—In supersession of Notification No. 2422—II/133-1904, dated 21st June 1904, Lala Har Swarup, Extra Assistant Conservator of Forests, leave on medical certificate for two months in extension of that granted to him by Notification No. 1729—II 33-1904, dated 4th May 1904.

6.—PUNJAB GAZETTE.

1st July 1904.—No. 284.—A.-L. No. 10.—Mr. A P. Percival, Assistant Conservator of Forests, Officiating Deputy Conservator, 4th grade, in the Central Provinces, on his return with effect from the forenoon of 28th November 1903 from the combined leave granted him in Central Provinces Notification No. 2086 of 21st May 1903, resumed his appointment of Officiating Deputy Conservator, 4th Grade.

9th July 1904.—No. 297.—Mr. C. F. Rossiter, Extra Deputy Conservator of Forests, and Lala Jwala Prasad, Extra Assistant Conservator of Forests, respectively made over and received charge of the Montgomery Forest Division on the forenoon of the 30th May 1904.

From that date Mr. Rossiter will hold charge of the Mooltan Forest Division only.

7.—CENTRAL PROVINCES GAZETTE.

25th June 1904.—No. 3789.—Privilege leave for fourteen days, under articles 246 and 260 of the Civil Service Regulations, is granted to Mr. Pandurang Narayan, Extra Assistant Conservator of Forests, in charge of the Basim Forest Division, with effect from the 14th June 1904.

Rai Bahadur Mansukh Rai, Extra Assistant Conservator of Forests, is placed in charge of the Basim Forest Division, in addition to his own duties.

4th July 1904.—No. 3946.—Mr. A. Hunt, Extra Assistant Conservator of Forests, 2nd grade, on return from deputation to the Bastar State, has

been posted to the Balaghat Forest Division on special duty, with effect from the afternoon of the 24th February 1904.

5th July 1904.—No. 3963.—Mr. B. Inamati Shama Rao, Extra Assistant Conservator of Forests, attached to the Seoni Forest Division by order No. 1984 of the 7th April 1904, was transferred to the Sambalpur Forest Division and placed on special duty in connection with the timber work in that Division from the 14th to the 17th May 1904, inclusive.

5th July 1904.—No. 3964.—Mr. B. Inamati Shama Rao, Extra Assistant Conservator of Forests, was re transferred to the Seoni Forest Division from 18th May 1904, and will remain attached to that Division until further orders.

5th July 1904.—No. 4.—Diwaker Balwant Burhanpura, Forest Ranger, 6th grade, on probation for six months, attached to the Raipur Forest Division, is confirmed in his appointment of Ranger, 6th grade, with effect from the 1st April 1903.

7th July 1904.—No. 5.—Pandit Diaker Vishnu Pranjpe, Forest Ranger, 3rd grade, by the orders of the Officiating Chief Commissioner, Central Provinces, conveyed in his Under Secretary's Letter No. 3896-A, dated the 1st July 1904, is restored to his place in the 2nd grade, with effect from the 1st July 1904, and is placed on the list immediately above Pandit Vinayek Chinnaji Bhagwat.

21st July 1904.—No. 4357.—Mr J. C. McDonnell, a Deputy Conservator of Forests of the 1st grade in the Central Provinces, whose services were replaced at the disposal of the Chief Commissioner, Central Provinces, with effect from the 14th March 1904, under Foreign Department Notification No. 1139-G, dated the 24th June 1904, retired from service on the 14th March 1904.

#### 8.—BURMA GAZETTE.

15th June 1904.—No. 286.—The following alteration in rank is ordered in the Forest Department:—

With effect from the 22nd April 1904, consequent on the departure on leave of Mr. F. H. Todd, Deputy Conservator of Forests, 4th grade, *prov. sub.*—

Mr. L. C. Davis, Assistant Conservator, 1st grade, *prov. sub.*, to officiate as Deputy Conservator 4th grade.

(2) With effect from the 31st March 1904, consequent on the retirement of Maung Yaing, Extra Assistant Conservator, 1st grade.—

Mr. W. H. Craddock, Extra Assistant Conservator, 1st grade, *prov. sub.*, to be confirmed in his appointment.

Mr. C. E. Allen, Extra Assistant Conservator, 2nd grade, Extra Assistant Conservator, 1st grade, *prov. sub.*

M. J. L. Heffrman, Extra Assistant Conservator, 2nd grade, *prov. sub.*, to be confirmed in this appointment.

Mr. S. A. Wood, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator 2nd grade, *prov. sub.*

Mr. S. E. F. Jenkins Extra Assistant Conservator, 3rd grade, *prov. sub.*, to be confirmed in his appointment.

Mr. B. P. Kelly, Extra Assistant Conservator, 4th grade, to be Extra Assistant Conservator 3rd grade, *prov. sub.*

Mr. Hatin Tai, Extra Assistant Conservator, 4th grade, *prov. sub.*, to be confirmed in his appointment.

21st June 1904.—No. 22.—With reference to Revenue Department Notification No. 249 (Forests), dated the 31st May 1904, Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, made over his duties to Mr. Watson, Deputy Conservator of Forests, on the afternoon of the 17th June 1904 prior to his proceeding on transfer to the Tharawaddy Division.

21st June 1904.—No. 295.—The following alterations in rank are ordered in the Provincial Forest Service:—

(1) With effect from the 4th December 1903—

Mr. C. S. Rogers, Extra Assistant Conservator, 1st grade, seconded for foreign service under the Trinidad Government, to be Extra Deputy Conservator, 4th grade.

Mr. C. H. Haldane, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade, *prov. sub.*, while Mr. C. S. Rogers remains seconded.

Mr. R. L. Pocock, Extra Assistant Conservator 1st grade, *prov. sub.* to be confirmed in his appointment.

Maung Tla Ka Do, Extra Assistant Conservator, 2nd grade, *prov. sub.* to be confirmed in his appointment.

Mr. P. E. Plunkett, Extra Assistant Conservator, 3rd grade, *prov. sub.*, to be confirmed in his appointment.

Mr. W. J. G. Cooper, Extra Assistant Conservator, 4th grade *prov. sub.*, to be confirmed in his appointment.

24th June 1904.—No. 300.—Mr. L. C. Davis, Officiating Deputy Conservator of Forests, was placed on special duty in the Rangoon Timber Depot from the 4th to the 8th June 1904.

25th June 1904.—No. 301.—Under the provisions of articles 291, 264A and 369 of the Civil Service Regulations (3rd edition), Mr. J. L. Heffernan, Extra Assistant Conservator of Forests, was granted privilege leave for thirteen days and leave on medical certificate in continuation thereof for five months and seventeen days with effect from the 11th September 1902.

This Department Notification No. 471, dated the 18th November 1902, is hereby cancelled.

5th July 1904.—No. 317 (Forests).—Under the provisions of articles 336 and 831 of the Civil Service Regulations, Mr. W. H. Craddock, Extra Assistant Conservator of Forests, is granted three months' leave on medical certificate in continuation of the leave granted him in this Department Notification No. 4 (Forests), dated the 6th January 1904.

4th July 1904.—No. 23.—With reference to Revenue Department Notification No. 251 (Forests), dated 31st May 1904, Mr. R. C. A. Pinder, Extra Assistant Conservator of Forests, was relieved of his duties in the Ruby Mines Forest Division on the afternoon of the 13th June 1904.

6th July 1904.—No. 17.—With reference to the Revenue Department Notification No. 249 (Forests), dated the 31st May 1904, Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, assumed charge of the South Tharrawaddy Forest Subdivision on the afternoon of the 29th day of June 1904, relieving Mr. J. C. Hopwood, Assistant Conservator of Forests.

7th July 1904.—No. 25.—On return from Forest School, Tharrawaddy, Maung Tun Tha, Ranger, 3rd grade, took over charge of the Meple-Thaungyin Range of the Thaungyin Division from Mr. C. H. Hearsey, Ranger, 2nd grade, on the forenoon of the 18th March 1904.

13th July 1904.—No. 26.—With reference to Revenue Department Notification No. 250 (Forests), dated 31st May 1904, Mr. J. C. Hopwood, Assistant Conservator of Forests, assumed charge of the Toungoo Forest Subdivision on the forenoon of the 7th July 1904.

8th July 1904.—No. 149.—At the Departmental Examination held at Mandalay on the 7th and 8th June 1904, the following officer passed the examination in the subject specified below according to the standard prescribed for the examination of Forest Officers:—

Law.—Mr. F. W. Collings, Assistant Conservator of Forests.

11th July 1904.—No. 323.—Mr. A. S. Rencontre, Extra Assistant Conservator of Forests, is permitted to return to duty, and is posted to the South Tenasserim Division as Assistant Manager of the Rubber Plantation at Mergui.

12th July 1904.—No. 327.—Under the provisions of articles 246 and 260 of the Civil Service Regulations, privilege leave for two months and

twenty-nine days is granted to Mr. R. R. O'Hara Extra Assistant Conservator of Forests, 3rd grade, with effect from the date on which he may avail himself of the leave.

#### 9.—ASSAM GAZETTE.

8th July 1904.—No. 6193G.—The following Notification by the Government of India in the Department of Revenue and Agriculture is republished:—

No. 720F.—174-04 (*Forests*), dated Simla, the 30th June 1904.—The following arrangements are made, with effect from the 20th June 1904, during the absence of Mr. E. E. Fernandez, Conservator of Forests, 1st grade, Berar Circle, Central Provinces, on the leave granted to him in the Notification of this Department No. 569F, dated the 26th May 1904, or until further orders:—

(1) Mr. E. S. Carr, Officiating Conservator of Forests, 2nd grade, to act in the 1st grade.

\* \* \* \* \*

#### 10.—MYSORE GAZETTE.—

29th June 1904.—No. 947—10752.—Under article 188 of the Mysore Service Regulations, Mr. Y. Seetharamaiya, Assistant Conservator of Forests, Hassan District, was granted privilege leave of absence for 7 days, that is, from the 18th to 24th April 1904, both days inclusive.

30th June—9th July 1904.—No. R. 4295.—Under article 188 of the Mysore Service Regulations, Mr. V. Narasinha Murti Rao, Sub-Assistant Conservator of Forests Shimoga District, was granted privilege leave of absence for twelve days, with effect from the 29th April 1904.



## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

18th August 1904.—No. 961-F.—Mr. E. E. Fernandez, Conservator of Forests, 1st grade, on return from the privilege leave granted to him in the Notification of this Department No. 569-F., dated 26th May 1904, resumed charge of the Berar Circle, Central Provinces, on the afternoon of the 10th August 1904.

From the same date Mr. E. S. Carr reverted to his officiating appointment of Conservator of Forests, 2nd grade.

22nd August 1904.—No. 978-258-1-F.—The following promotions are made, with effect from the 15th August 1904, in consequence of the appointment of Mr. S. Eardley-Wilmot to be Inspector-General of Forests:—

- (i) Mr. E. G. Chester, Conservator, 2nd (officiating 1st) grade, Punjab, is confirmed in the latter grade.
- (ii) Mr. E. S. Carr, Conservator, 3rd (officiating 2nd) grade, Assam, is confirmed in the latter grade.
- (iii) Mr. H. A. Hoghton, Deputy Conservator, 2nd grade, Punjab on leave, is appointed to be Conservator, 3rd grade.

25th August 1904.—No. 992-213-4-F. *Erratum*.—In the Notification of this Department No. 775—213-2-F., dated the 8th July 1904, substitute the following for the second clause:—

Mr. H. Jackson, Officiating Conservator of Forests, 3rd grade, and Deputy Director of the Imperial Forest School, Dehra Dun, to be Director of the Imperial Forest School, and to hold charge of the School Circle, United Provinces.

Mr. R. McIntosh, Instructor, Imperial Forest School, Dehra Dun, to be Deputy Director of the Imperial Forest School.

### 2.—MADRAS GAZETTE.

29th July 1904.—*Cancellation of Leave*.—The two months' privilege leave granted to M. R. Ry. V. Kalyanarama Aiyar, Ranger, Ganjam district, in this office Service Order No. 130, of 1904, dated 9th July 1904, is cancelled.

2nd August 1904.—*Transfer*.—Sayed Burhan-ud-din Sahib Bahadur, Extra Assistant Conservator of Forests, 4th grade, from North Salem to North Arcot as a temporary measure.

3rd August 1904.—No. 309.—*With effect from the date on which Mr. A. W. Lushington returned from privilege leave*—

- (1) Mr. Frank Adriaan Lodge to act as Deputy Conservator of Forests, 1st grade.
- (2) Mr. Ernest Radcliffe Murray to revert as Deputy Conservator of Forests, 2nd grade.

*During the absence of Mr. F. A. Lodge on privilege leave combined with special leave*—

- (3) Mr. Ernest Radcliffe Murray to act as Deputy Conservator of Forests 1st grade, from the date of expiry of Mr. Lodge's privilege leave.

(4) Mr. Charles Mortimer Hodson to act as Deputy Conservator of Forests, 2nd grade, until the return of Mr. P. M. Lushington from privilege leave.

(5) Mr. Arthur Bushe Jackson to act as Deputy Conservator of Forests, 2nd grade, from the date of Mr. P. M. Lushington's return from privilege leave.



(6) Mr. Henry Tireman to act as Deputy Conservator of Forests, 3rd grade, *vice* No. (4).

(7) Mr. Hugo Francis Andrew Wood to act as Deputy Conservator of Forests, 3rd grade, *vice* No. (5).

(8) Mr. Robert Daniel Richmond to act as Deputy Conservator of Forests, 4th grade, with effect from the date on which Mr. H. F. Arbuthnot returns from leave.

6th August 1904.—*Leave*.—M.R.Ry. N. Swaminatha Aiyar, Ranger Kurnool West, is granted privilege leave for one and a half months from date of relief.

*Transfers*.—The following transfers are ordered :—

M.R. Ry. B. Sanniah, Ranger, from Anantapur to Godavari.

9th August 1904.—*Departmental Test*.—The following subordinates have passed the departmental test in parts noted against each of section 69 of the Forest Code at the examination held on the 25th July 1904 :—

| Name and Designation.                               | In Part (a) or (b). |
|---|---------------------|
| T. M. Iyaccannoo Pillai, Acting Deputy Ranger, III. | Part (a).           |
| K. Narayanan Nair, Probationary Deputy Ranger, III. | Parts (a) and (b)   |

10th August 1904.—*Departmental Test*.—The following is the result of the Departmental Test examination held in July 1904 :—

| No. | Name                        | Designation.                           | Subjects passed.                                      |
|-----|-----------------------------|--|---|
| 1   | C. D. Parthasarathy Chetti. | Forester, 2nd grade, acting Cuddapah.  | Forest Accounts and Returns.                          |
| 2   | P. S. Varadakrishnamachari. | Forester, 3rd grade, North Arcot.      | Forest Accounts and Returns and Forest Act and Rules. |
| 3   | C. M. Natesa Mudaliar.      | Forester 3rd grade, Cuddapah.          | Forest Accounts and Returns.                          |
| 4   | P. M. Krishnaswami Naidu.   | Forester, 2nd Grade, Nellore.          | Forest Accounts and Returns.                          |
| 5   | C. M. Sundara Rao           | Forester, 2nd grade, acting, Cuddapah. | Forest Act and Rules.                                 |

18th August 1904.—*Promotions*.—The following promotions in the Rangers' class are sanctioned in Board's Proceedings, Forest Mis. No. 700, dated 11th August 1904, with effect from 1st August 1904 :—

Mr. A. G. Van Haef en, Ranger, from 2nd grade and acting 1st grade to 1st grade, permanent.

Mr. A. B. Myers, Ranger, from 3rd grade and acting 2nd grade, to 2nd grade, permanent.

Mr. M. S. Noronha, Ranger, from 3rd grade and acting 2nd grade to 2nd grade, permanent.

Mr. A. F. X. Saldanah, Ranger, from 3rd grade and acting 2nd grade, to 2nd grade, permanent.

M.R.Ry. M. Panchapikesa Aiyar, Ranger, from 3rd grade to 2nd grade, acting sub. *pro tem*.

M.R.Ry. T. V. Arumugam Pillai, Ranger, from 4th grade and acting 3rd grade, to 3rd grade, permanent

M.R.Ry. K. Gajaraja Mudaliar, Ranger, from 5th grade and acting 4th grade, to 4th grade permanent.

Mr. F. S. Brito, Ranger, from 5th grade, and acting 4th grade, to 4th grade permanent.

M.R.Ry. K. R. Venkataramana Aiyar, Ranger, from 4th grade supernumerary, to 4th grade, permanent.

Mr. A. M. C. Littlewood, Ranger, from 4th grade supernumerary to 4th grade permanent

M.R.Ry. S. V. Venkataramana Aiyar, Ranger, from 6th grade and acting 5th grade, to 5th grade permanent.

M.R.Ry. K. S. Narayana Aiyangar, Ranger, from 6th grade and acting 5th grade, to 5th grade permanent.

**3.—BOMBAY GAZETTE.**

10th August 1904.—No. 6106.—Mr. O. H. L. Napier, Divisional Forest Officer, Belgaum, is granted privilege leave of absence for two months and twenty-six days with effect from 23rd August 1904, or the subsequent date on which he may avail himself of it.

10th August 1904.—No. 6107.—His Excellency the Governor in Council is pleased to appoint Mr. D. A. Thomson to act as Divisional Forest Officer, Belgaum, in addition to his own duties, during the absence on privilege leave of Mr. O. H. L. Napier, or pending further orders.

16th August 1904.—No. 6276.—Mr. W. A. Talbot, Conservator of Forests, 2nd grade, has been allowed by His Majesty's Secretary of State for India to return to duty before the expiry of his leave.

**4.—BENGAL GAZETTE.**

19th August 1904.—No. 3898 A.—Mr. H. H. Haines, Deputy Conservator of Forests, in charge of Tista Forest Division, is vested with the powers of a Magistrate of the third class in that part of the Darjeeling district which is included in the Tista Forest Division.

**5.—UNITED PROVINCES GAZETTE.**

25th August 1904.—No. 3251-II—33-1904.—Lala Harsarup, Extra Assistant Conservator of Forests, on return from leave, to be attached to the Naini Tal Forest Division of the Central Circle.

**6.—PUNJAB GAZETTE.**

29th July 1904.—No. 317.—Mr. C. F. Rossiter, Extra Deputy Conservator of Forests, and Lala Jowala Pershad, Extra Assistant Conservator of Forests, respectively, made over and received charge of the Mooltan Forest Division, on the forenoon of the 6th July 1904, consequent on the former's proceeding on 59 days' privilege leave.

Lala Jowala Pershad will hold charge of the Mooltan Division in addition to the Montgomery Division.

29th July 1904.—No. 322.—Pandit Thakur Das, Extra Assistant Conservator, made over to Munshi Fazl Din, Khan Bahadur, Extra Assistant Conservator, charge of the Chenab Forest Division, on the forenoon of the 1st July 1904, and received from Mr. Fazal-ud-din, Extra Assistant Conservator, charge of the Lahore Forest Division, on the afternoon of 7th idem, consequent on the latter's deputation to the Patiala State.

Munshi Fazl Din, Khan Bahadur, will hold charge of the Chenab Division in addition to the Shahpur Division until further orders.

3rd August 1904.—No. 327.—A. L. No. 10.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each :—

| Name.               | Present Grade.                             | Grade to which promoted or reverted. | With effect from | Remarks.   |
|---------------------|--|--------------------------------------|------------------|--|
| Mr. R. Williamson   | Officiating Deputy Conservator, 2nd grade. | Deputy Conservator, 3rd grade.       | 8th March 1904.  | Consequent on Mr. A. W. Blunt's return from privilege leave. |
| Mr. S. I. Kenny ... | Officiating Deputy Conservator, 3rd grade. | Deputy Conservator, 4th grade.       |                  |  |

| Name.                              | Present Grade.   | Grade to which promoted or reverted.  | With effect from | Remarks.  |
|------------------------------------|--|---|------------------|---|
| Mr. A. M. F. Caola                 | Officiating Deputy Conservator, 2nd grade.   | Provisional Deputy Conservator, 2nd grade.  | 10th March 1904  | Consequent on Mr. A. W. Blunt's deputation to Kashmir State.  |
| Mr. R. Williamson                  | Deputy Conservator, 3rd grade.   | Officiating Deputy Conservator, 2nd grade.  |                  |   |
| Mr. H. E. Bartlett                 | Officiating Deputy Conservator, 3rd grade.   | Provisional Deputy Conservator, 3rd grade.  |                  |   |
| Mr. S. L. Kenny                    | Deputy Conservator, 4th grade.   | Officiating Deputy Conservator, 3rd grade.  |                  |   |
| Mr. A. J. Gibson                   | Officiating Deputy Conservator, 4th grade.   | Provisional Deputy Conservator, 4th grade.  |                  |   |
| Mr. A. E. Lowrie                   | Provisional Deputy Conservator, 1st grade.   | Deputy Conservator, 1st grade.  | 14th March 1904  | Consequent on the retirement of Mr J. C. McDonnell.   |
| Mr. A. W. Blunt                    | Provisional Deputy Conservator, 2nd grade.   | Deputy Conservator, 2nd grade.  |                  |   |
| Mr. B. O. Coventry                 | Provisional Deputy Conservator, 3rd grade.   | Deputy Conservator, 3rd grade.  |                  |   |
| Flint I (Central Provinces, Berar) | Assistant Conservator, 1st grade.  | Deputy Conservator, 4th grade.  |                  |   |
| Mr. A. J. Gibson                   | Provisional Deputy Conservator, 4th grade.   | Officiating Deputy Conservator, 4th grade.  |                  |   |
| Mr. A. D. Blascheck                | Provisional Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade. | Assistant Conservator, 1st grade and Officiating Deputy Conservator, 4th grade.           | 18th June 1904   | Consequent on Mr. C. Somers-Smith's departure on 1 month and 15 days' privilege leave from the afternoon of 17th June 1904. |
| Mr. H. E. Bartlett                 | Provisional Deputy Conservator, 3rd grade.   | Provisional Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade. |                  |   |
| Mr. S. R. Hole                     |  |   |                  |   |
| Mr. D. O. Witt                     | Provisional Deputy Conservator, 4th Grade.   | Provisional Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade. |                  |   |
| Mr. J. O. Carroll                  |  |   |                  |   |

13th August 1904.—No. 340.—A. L. No. 11.—Mr C. J. Trevor, Assistant Conservator of Forests, was transferred from the Chamba Forest Division and took over charge of the Direction Division from Mr. E. G. Chester, Conservator of Forests, Punjab, on the afternoon of the 29th July 1904.

23rd August 1904.—No. 360.—A. L. No. 12.—The following changes have taken place in the List of Forest Officers in the Associated Provinces with effect from the date specified against each :—

| Name.                | Present Grade.  | Grade to which promoted or reverted.       | With effect from | Remarks.   |
|----------------------|---|--|------------------|--|
| Mr. H. E. Bartlett   | Provisional Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade. | Provisional Deputy Conservator, 3rd grade. | 2nd August 1904  | Consequent on return from privilege leave of Mr. Somers-Smith. |
| Mr. E. S. Hole ...   | Provisional Deputy Conservator, 4th grade and Officiating Deputy Conservator, 3rd grade   | Provisional Deputy Conservator, 4th grade. |                  |  |
| Mr. D. O. Witt ...   |   |  |                  |  |
| Mr. J. C. Carroll .. |   |  |                  |  |

#### 7.—CENTRAL PROVINCES GAZETTE.

17th July 1904.—No. 44.—Privilege leave on full pay for three months, under Article 260 of the Civil Service Regulations, is granted to Mahadu Chamru, Deputy Ranger, 4th grade, Permanent Establishment, Ellichpur Division, with effect from the 10th August 1904, or such subsequent date as he may be permitted to avail himself of it.

18th July 1904.—No. 47.—Privilege leave, with an allowance of Rs. 20 per mensem for three months, under Article 260 of the Civil Service Regulations, is granted to Gopal Anrit, Deputy Ranger, 3rd grade, Permanent Establishment, Ellichpur Division, with effect from the 20th July 1904, or such subsequent date as he may be permitted to avail himself of it.

9th July 1904.—No. 48.—Privilege leave on full pay for one month, under Article 260 of the Civil Service Regulations, is granted to Narsing Rao, Forest Ranger, 1st grade, Permanent Establishment, Ellichpur Division, with effect from the 18th July 1904, or such subsequent date as he may be permitted to avail himself of it.

26th July 1904.—No. 4477.—Privilege leave for two months, under Articles 246 and 260 of the Civil Service Regulations, is granted to Mr. G. F. Taylor, Deputy Conservator of Forests, 1st grade, in charge of the Chhindwara Forest Division, with effect from the 15th August 1904, or subsequent date on which he may avail himself of it.

Mr. D. N. Avasia, Forest Ranger, attached to the Raipur Forest Division, is transferred to the charge of the Chhindwara Forest Division during the absence of Mr. G. F. Taylor, or until further orders.

28th July 1904.—No. 78.—Babu Bishan Dass Madan, Forest Ranger, 6th grade, on probation, attached to the Damoh Forest Division, is confirmed in his appointment with effect from the 1st May 1904.

5th August 1904.—No. 4723.—On the expiry of the leave granted to him by Order No. 3577, dated the 17th June 1904, Mr. C. Somers-Smith, Deputy Conservator of Forests, is posted to the charge of the Saugor Forest Division.

5th August 1904.—No. 4724.—On relief by Mr. C. Somers-Smith, Mr. J. J. Hobday, Extra Assistant Conservator of Forests, in charge of the

Saugor Forest Division, is posted to the charge of the Hoshangabad Forest Division.

5th August 1904.—No. 4725.—Privilege leave for three months, under Articles 246 and 260 of the Civil Service Regulations, is granted to Mr. A. M. F. Caccia, Deputy Conservator of Forests, in charge of the Hoshangabad Forest Division, with effect from the date of his relief by Mr. J. J. Hobday.

15th August 1904.—No. 4965.—Privilege leave for one day, under Articles 246 and 260 of the Civil Service Regulations, is granted to Mr. Pandurang Narayan, Extra Assistant Conservator of Forests, in charge of the Basim Forest Division, in extension of the fourteen days' privilege leave granted him by Order No. 3789, dated the 25th June 1904.

15th August 1904.—No. 4967.—On relief by Mr. C. Somers-Smith, Mr. J. J. Hobday, Extra Assistant Conservator of Forests, will remain attached to the Saugor Forest Division till he relieves Mr. A. M. F. Caccia of the charge of the Hoshangabad Forest Division on or about the 19th instant, or until further orders.

Order No. 4724, dated the 5th August 1904, is hereby cancelled.

18th August 1904.—No. 5063.—Privilege leave for two months and seven days, under Articles 246 and 260 of the Civil Service Regulations, is granted to Mr. Ramchandra Krishna, Extra Assistant Conservator of Forests, 1st grade, attached to the Nimar Forest Division, with effect from the 23rd August 1904, or the subsequent date on which he may avail himself of it.

#### 8.—BURMA GAZETTE.

15th July 1904. — No. 330.—The following alterations in rank are ordered in the Forest Department:—

- (1) With effect from the 11th May 1904, consequent on the departure on leave of Mr. W. T. T. McHarg, Deputy Conservator, 3rd grade:—  
Mr. J. Messer, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. G. K. Parker, Deputy Conservator, 4th grade, *prov. sub.*, to officiate as Deputy Conservator, 3rd grade.

Mr. R. E. Marsden, Assistant Conservator, 1st grade, *prov. sub.*, to officiate as Deputy Conservator, 4th grade.

- (2) With effect from the 12th May 1904, consequent on the appointment of Mr. J. Copeland, Deputy Conservator, 1st grade, as officiating Conservator—

Mr. G. F. R. Blackwell, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. H. H. Forteach, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. S. R. Troup, Deputy Conservator, 4th grade, *prov. sub.*, to officiate as Deputy Conservator, 3rd grade.

- (3) With effect from the 16th May 1904, consequent on the return from leave of Mr. C. R. Dun, Deputy Conservator, 4th grade—

Mr. R. C. Dun, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. R. S. Troup, Deputy Conservator, 4th grade, *prov. sub.* (officiating Deputy Conservator, 3rd grade), to revert to his *prov. sub.* appointment.

- (4) With effect from the 25th May 1904, consequent on the departure on leave of Mr. S. Carr, Deputy Conservator, 3rd grade, *prov. sub.*—

Mr. R. S. Troup, Deputy Conservator, 4th grade, *prov. sub.*, to officiate as Deputy Conservator, 3rd grade.

14th July 1904. — No. 18.—Maung Nyo Dun, Ranger, 3rd grade, Depot and Agency Division, is transferred to the Prome Division, for special duty connected with Timber Depots for one month from the 28th June 1904.

21st July 1904.—No. 335 (FORESTS).—In Revenue Department Notification No. 251 (Forests), dated the 31st May 1904, for the words “to the charge of the Railway Revenue Range in the Toungoo Forest Division,” read “to the charge of the Railway Revenue Range, Tenasserim Circle, with headquarters at Toungoo.

23rd July 1904.—No. 21.—With reference to Revenue Department Notification No. 327 (Forests), dated the 13th July 1904, Mr. R. R. O'Hara, Extra Assistant Conservator of Forests, availed himself of the leave granted therein after handing over charge of the Nawin subdivision, Prome, to Mr. C. W. Doveton, Deputy Conservator of Forests, Prome, on the afternoon of the 15th July 1904.

29th July 1904.—No. 28.—With reference to Revenue Department Notifications Nos. 251 and 335 (Forests), dated the 31st May and 21st July 1904, Mr. R. C. A. Pinder, Extra Assistant Conservator of Forests, assumed charge of the Railway Revenue Range, Tenasserim Circle, with headquarters at Toungoo, on the forenoon of the 29th June 1904.

3rd August 1904.—No. 348.—Under the provisions of Articles 233, 260 and 308 (b) of the Civil Service Regulations, Mr. A. E. Ross, Deputy Conservator of Forests, is granted privilege leave for two months and thirty days and furlough in continuation thereof for one year and six months with effect from the date on which he may avail himself of the privilege leave.

8th August 1904.—No. 362.—With reference to the Government of India's Notification of the Department of Revenue and Agriculture, No. 619—185-2-F, dated the 6th June 1904, by which the services of Mr. C. S. Rogers, Extra Assistant Conservator of Forests, are permanently placed at the disposal of His Majesty's Colonial Office, His Honour the Lieutenant-Governor directs that the following promotions shall be made in the Provincial Forest Service in supersession of the promotions made in this Department Notification No. 295 (Forests), dated the 21st June 1904:—

(1) With effect from the 4th December 1903—

Mr. C. H. Haldane, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

Mr. R. L. Pocock, Extra Assistant Conservator, 1st grade, *prov. sub.*, to be confirmed in his appointment.

Mr. W. H. Craddock, Extra Assistant Conservator, 1st grade, *prov. sub.*, to be confirmed in his appointment.

Maung Tha Ka Do, Extra Assistant Conservator, 2nd grade, *prov. sub.*, to be confirmed in his appointment.

Mr. J. L. Hefferman, Extra Assistant Conservator, 2nd grade, *prov. sub.*, to be confirmed in his appointment.

Mr. P. E. Plunkett, Extra Assistant Conservator, 3rd grade, *prov. sub.*, to be confirmed in his appointment.

Mr. S. E. F. Jenkins, Extra Assistant Conservator, 3rd grade, *prov. sub.*, to be confirmed in his appointment.

Mr. W. J. G. Cooper, Extra Assistant Conservator, 4th grade, *prov. sub.*, to be confirmed in his appointment.

Mr. Hatim Tai, Extra Assistant Conservator, 4th grade, *prov. sub.*, to be confirmed in his appointment.

(2) With effect from the 31st March 1904, consequent on the retirement of Maung Yaing, Extra Assistant Conservator, 1st grade—

Mr. C. E. Allen, Extra Assistant Conservator, 2nd grade, to be Extra Assistant Conservator, 1st grade.

Mr. S. A. Wood, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator, 2nd grade.

Mr. B. P. Kelly, Extra Assistant Conservator, 4th grade, to be Extra Assistant Conservator, 3rd grade.

3rd August 1904.—No. 192.—At the departmental examination held at Bassein, Akyab, Moulmein, Mergui, Minbu, Pakokku, Meiktila, Mandalay.

Mogok, Myitkyina, Monywa, Kindat, Lashio and Falam on the 6th and 7th June 1904, the following candidates passed the examination in Burmese by the standards specified below :—

*Higher standard.*

Mr. G. R. Jeffery, Assistant Conservator of Forests.

*Lower standard.*

Mr. B. R. Hutchins Forest Ranger.

Mr. F. Dalton, Forest Ranger.

9th August 1904.—No. 22.—With reference to this Office Notification No. 18, dated the 14th July 1904, Maung Nyo Dun, Ranger, 3rd grade, reported his return from the Prome Division, and assumed charge of his duties in the Depot and Agency Division, on the forenoon of the 3rd August 1904.

9.—ASSAM GAZETTE.

29th July 1904.—No. 6966 G.—In consequence of the retirement, on the termination of his foreign service in Ceylon, of Mr. J. L. Pigot, Deputy Conservator of Forests, 1st grade, *vacated*, the following confirmations are made with effect from the 10th April 1904 :—

Mr. D. P. Copeland, Deputy Conservator of Forests, 1st grade, sub. *pro tem.*, is confirmed in that grade.

Mr. H. G. Young, Deputy Conservator of Forests, 2nd grade, sub. *pro tem.*, is confirmed in that grade.

Mr. E. M. Coventry, Deputy Conservator of Forests, 3rd grade, sub. *pro tem.*, is confirmed in that grade.

Mr. W. A. R. Doxat, Deputy Conservator of Forests, 4th grade, sub. *pro tem.*, is confirmed in that grade, and will continue to officiate in the 3rd grade.

4th August 1904.—No. 7100 G.—Mr. W. A. R. Doxat, Deputy Conservator of Forests, in charge of the Sibsagar Forest Division, is granted privilege leave for three months, combined with furlough for one year under Articles 233 and 308 (b) of the Civil Service Regulations, with effect from the 16th August 1904, or the subsequent date on which he may be relieved.

4th August 1904.—No. 7101 G.—Mr. F. H. Cavendish, Officiating Deputy Conservator of Forests, in charge of the Lakhimpur Forest Division, is appointed to hold charge of the Sibsagar Forest Division, in addition to his own duties until further orders.

25th August 1904.—No. 7568 G.—With effect from the 18th August 1904, in consequence of the departure on leave of Mr. W. A. B. Doxat, Officiating Deputy Conservator of Forests, 3rd grade—

Mr. F. H. Cavendish, Officiating Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 3rd grade.

10.—MYSORE GAZETTE.

21st July 1904.—No. R. 363-11-4.—Under Article 183 of the Mysore Service Regulations Mr. G. E. Ricketts, Deputy Conservator of Forests in charge of Game Preserves, is granted privilege leave of absence for fifteen days, with effect from the 25th July 1904.

28th July 1904.—No. R. 725-13-2.—Mr. M. Venkatnarnappa, Deputy Conservator of Forests, is, under Article 165A of the Mysore Service Regulations, granted leave on medical certificate for six months combined with the three months' privilege leave of absence sanctioned in Notifications Nos. 809-9210 and 896-10031, dated respectively the 7th and the 31st May 1904.

29th July 1904.—No. R. 765-24-2.—The two months' leave of absence on medical certificate granted in Notifications Nos. 907-10136 and R. 63-9-12,

dated respectively the 6th June and the 13th July 1904, to Mr. S. A. Bapu Rao, Deputy Conservator of Forests, Kolar District, is hereby extended by two weeks.

*1st August 1904.*—No. R. 821 33-3.—Rai Bahadur Mr. M. Muthannah is confirmed as Conservator of Forests in Mysore, with effect from the 23rd December 1901, the date on which he was appointed to officiate in that post.

*15th August 1904*—No. R. 1316-41-2.—Under Article 188 of the Mysore Service Regulations, Mr. B. Ramasawmy Iyer, B.A., Assistant Conservator of Forests, is granted privilege leave of absence for three months, with effect from the 15th August 1904, or from such other date as he may avail himself of the same.

*17th August 1904.*—No. R. 1390-11-6.—The fifteen days' privilege leave granted to Mr. G. E. Ricketts, Deputy Conservator of Forests in charge of Game Preserves, in Notification No. B. 363-11-4, dated the 21st July 1904, is hereby cancelled at his own request.





## VIII—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

30th August 1904.—No. 1007—93-9-F.—The following transfers are made in the interests of the public service :—

- (i) Mr. B. B. Oamaston, Deputy Conservator of Forests, 2nd grade, from Bengal to the Andamans.
- (ii) From the date of his being relieved by Mr. Oamaston of the charge of the Andamans Forests, Mr. C. G. Rogers, Deputy Conservator of Forests, 2nd grade, is placed on special duty for two months.

31st August 1904.—No. 1014—81-5-F.—The services of Mr. W. F. L. Tottenham, Deputy Conservator of Forests, are replaced at the disposal of the Government of Burma, with effect from the date on which he relinquished charge of his duties as Conservator of Forests in Siam.

31st August 1904.—No. 1016—166-5-F.—The services of Mr. D. O. Witt, Deputy Conservator of Forests, are replaced at the disposal of the Honourable the Chief Commissioner of the Central Provinces, with effect from the date on which he relinquished charge of his duties as Deputy Conservator of Forests in Siam.

18th September 1904.—No. 1057-F.—111-22.—The services of Mr. N. C. McLeod, Extra Assistant Conservator of Forests, 1st grade, Central Provinces, are placed at the disposal of His Majesty's Colonial Office for employment in Southern Nigeria for a period of three years.

20th September 1904.—No. 1067—32-11-F.—With reference to the notification of the Government of Bengal, No. 1492-T. R., dated the 21st June 1904, Mr. E. P. Stebbing, Deputy Conservator of Forests, 4th grade, is placed on special duty as Forest Entomologist, for a period of three years, with effect from the 5th September 1904.

### 2.—MADRAS GAZETTE.

17th August 1904.—*Extension of Leave.*—The two months' leave on medical certificate granted to A. N. Bhujanga Row, Acting Ranger, 6th grade, Bellary district, in this office Service Order No. 217 of 1903, dated 19th December 1903, is extended by four days.

18th August 1904.—*Promotion.*—M. Streenivasa Row, Forester, 2nd grade, and Acting Deputy Ranger, 1st grade, Kurnool East, is promoted to act as Ranger, 6th grade, from 1st August 1904, on probation for six months.

20th August 1904.—*Promotions.*—The following promotions in the class of Rangers are ordered with effect from 1st August 1904 :—

- (1) M. R. Ry. C. Subramania Aiyar, Ranger, Nellore, from 3rd grade and acting in the 2nd grade, to 2nd grade, permanent.
- (2) M. R. Ry. A. N. Hanumantha Row, Ranger, Trichinopoly, from 3rd grade and acting in the 2nd grade, to 2nd grade permanent.
- (3) M. R. Ry. T. Shanmuga Mudaliar, Ranger, Cuddapah, from 4th grade and acting in the 3rd grade, to 3rd grade, permanent.
- (4) M. R. Ry. C. Rajagopaul Naidu, Ranger, North Arcot, from 4th grade and acting in the 3rd grade, to 3rd grade, permanent.
- (5) M. R. Ry. A. Subba Row, Ranger, Nellore, from 4th grade and acting in the 3rd grade, to 3rd grade, permanent.
- (6) M. R. Ry. K. P. Krishna Aiyar, Ranger, Trichinopoly, from 4th grade and acting in the 3rd grade, to 3rd grade, permanent.
- (7) M. R. Ry. A. Venkatanarayana Aiyah, Ranger, North Arcot, from 5th grade and acting in the 4th grade, to 4th grade, permanent.
- (8) M. R. Ry. T. S. Subramania Aiyar, Ranger, Cuddapah, from 6th grade and acting in the 5th grade, to 5th grade, permanent.

(9) M. B. Ry. P. V. Alagiriswami Naidu, Ranger, Nellore, under transfer to South Salem, from 6th grade, to 5th grade, permanent.

(10) M. R. Ry. K. R. Nanikkam Mudaliar, Ranger, South Arcot, from 6th grade, to 5th grade, acting sub. *pro tem*.

22nd August 1904.—*Promotions*.—The Board has, in its Proceedings, F. No. 700 Mis., dated 11th August 1904, sanctioned the following promotions in the class of Rangers to take effect from 1st August 1904:—

(1) P. Anantha Row, Ranger, Bellary, from 2nd grade, and acting in the 1st grade, to 1st grade, permanent.

(2) G. W. Thompson, Ranger, Vizagapatam, from 2nd grade to 1st grade, permanent.

(3) S. Eggia Narayana Sastri, Ranger, Ganjam, from 3rd grade, and acting in the 2nd grade, to 2nd grade, permanent.

(4) K. Aswatham Naidu, Ranger, Kurnool, from 3rd grade to 2nd grade, acting sub. *pro tem*.

(5) K. S. Krishnama Chari, Ranger, Godavari, from 4th grade, and acting in the 3rd grade, to 3rd grade, permanent.

(6) N. S. Anantha Charlu, Ranger, Kistna, from 4th grade to 3rd grade acting sub. *pro tem*.

(7) D. A. Stracey, Ranger, Godavari, from 4th grade to 3rd grade, acting sub. *pro tem*.

(8) Shaik Rahimatullah Sahib, Ranger, Kurnool, from 5th grade to 4th grade, permanent.

(9) E. M. Crothera, Ranger, Kurnool, from 6th grade, and acting in the 5th grade, to 5th grade, permanent.

24th August 1904.—*Transfer*.—Mr. J. P. Nazareth, Forest Ranger, 5th grade, will, on return from leave on 18th September 1904, be transferred from North Coimbatore to South Canara.

26th August 1904.—No. 329.—Under Article 260 of the Civil Service Regulations, Mr. Charles Edward Brasier, Conservator of Forests, is granted privilege leave for one month and twenty-six days with effect from the date of his relief.

29th August 1904.—*Transfer*.—A. S. Mariapragasam Pillai, Forest Ranger, 3rd grade, is transferred from Southern Circle to Central Circle.

29th August 1904.—No. 336.—Mr. Francis Cowley Loftus Cowley-Brown, to be District Forest Officer, Bellary.

31st August 1904.—*Posting and Leave*.—L. Hanumanthulu, Ranger, 2nd grade, Ganjam district, on return from leave, is posted to Kistna (new Guntur).

A Srinivasa Hebbar, Ranger, 5th grade, Kistna (new Guntur) district, is granted one month's privilege leave and five months' furlough from date of relief by Ranger L. Hanumanthulu.

1st September 1904.—No. 335.—M. R. Ry. Coimbatore Muthuswami Maduranayagan Pillai Avargal, Extra Assistant Conservator of Forests, is granted combined privilege leave and furlough for six months with effect from the date of his relief.

16th September 1904.—No. 349.—*Postings*.—Mr. Cecil Barry Dawson to be District Forest Officer, Guntur.

No. 350.—Mr. Frederick Adolphus Seager to be District Forest Officer, Kistna.

*Note*.—The above two appointments will take effect from the 1st October 1904.

### 3.—BOMBAY GAZETTE.

31st August 1904.—No. 6656.—Mr. F. Gleadow, Conservator of Forests, 3rd grade, has been allowed by His Majesty's Secretary of State for India, an extension of furlough for one month.

31st August 1904.—No. 6658.—Mr. F. Gleadow, Conservator of Forests, 3rd grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

23rd September 1904.—No. 7246.—Gradation List of Conservators, Deputies, Assistants, Extra Deputy and Extra Assistant Conservators, as it stood on the 1st August 1904.

NOTE.—Professionally trained officers are indicated by an asterisk before their names—vide G. R., R. D., No. 5296, dated 24th July 1896.

| Appointment.                             | No. | Holder of the Substantive Appointment. | Cause of vacancies.                            | Holder of Acting Appointment in grade. | Date of Appointment to act in grade. | REMARKS.  |
|--|-----|--|--|--|--------------------------------------|---|
| 1  | 2   | 3                                      | 4  | 5                                      | 6                                    | 7   |
| <b>Conservators—</b>                     |     |  |  |  |                                      |   |
| First grade: 1 appointment on Rs.1,600   | 1   | *Mr. T. B. Fry...                      | ...  | ...                                    | ...                                  |   |
| Second grade: 1 appointment on Rs.1,400. | 1   | *Mr. W. A. Talbot                      | On furlough for 18 months from 20th June 1903. | ...                                    | ...                                  |   |
| Third grade: 1 appointment on Rs.1,200.  | 1   | *Mr. F. Glendow                        | On furlough for 16 months from 20th June 1903. | Mr. H. Murray.<br>Mr. G. P. Millett    | 19th Oct. 1903.<br>29th May 1903.    | (Excess in this grade met by a vacancy in the 2nd grade of Conservators.) |
| <b>Deputy Conservators—</b>              |     |  |  |  |                                      |   |
| First grade: 2 appointments on Rs.900.   | 1   | Mr. W. G. Betham                       | ...  | Mr. T. R. D. Bell                      | 29th June 1903.                      |   |
|  | 2   | *Mr. H. Murray                         | Acting Conservator.                            | ...                                    | ...                                  |   |
| Second grade: 4 appointments on Rs.800.  | 1   | Mr. A. D. Wilkins                      | ...  | Mr. G. M. Ryan                         | 24th March 1903.                     |   |
|  | 2   | *Mr. H. W. Keys                        | ...  | Mr. E. G. Oliver                       | 16th May 1903.                       |   |
|  |     | *Mr. G. P. Millett                     | Acting Conservator.                            | ...                                    | ...                                  |   |
|  | 4   | *Mr. T. R. D. Bell                     | Acting 1st grade Deputy Conservator.           | ...                                    | ...                                  |   |
|  | 1   | Mr. G. M. Ryan...                      | Acting 2nd grade Deputy Conservator.           | Mr. W. E. Copleston.                   | 9th April 1902.                      |   |
| Third grade: 7 appointments on Rs.65.    | 2   | *Mr. E. G. Oliver                      | Do.  | Mr. D. A. Thomson.                     | 11th April 1903.                     |   |
|  | 3   | *Mr. L. S. Osmaston.                   | ...  | ...                                    | ...                                  |   |
|  | 4   | (Temporary Pilot.)                     | ...  | ...                                    | ...                                  |   |
|  | 5   | *Mr. W. F. D. Fisher.                  | ...  | ...                                    | ...                                  |   |
|  | 6   | *Mr. O. H. L. Napier.                  | ...  | ...                                    | ...                                  |   |
|  | 7   | *Mr. G. R. Duxbury.                    | ...  | ...                                    | ...                                  |   |

| Appointment.   | No. | Holder of the Substantive Appointment.                    | Cause of vacancies.                    | Holder of Acting Appointment in grade. | Date of Appointment to act in grade. | REMARKS. |
|--|-----|---|--|--|--------------------------------------|----------|
|  | 2   | 3   | 4                                      | 5                                      | 6                                    | 7        |
| Fourth grade: 6 appointments on Rs. 550.   | 1   | *Mr. W. E. Copleston.                                     | Acting 3rd grade Deputy Conservator.   | Mr. R. S. Pearson.                     | 15th Nov. 1901.                      |          |
|  | 2   | *Mr. D. A. Thomson.                                       | Do.                                    | Mr. O. S. McKenzie.                    | 2nd March 1903.                      |          |
|  | 3   | *Mr. J. Dodgson   | ...                                    | ...                                    | ...                                  |          |
|  | 4   | *Mr. A. G. Edie.  | ...                                    | ...                                    | ...                                  |          |
|  | 5   | *Mr. E. M. Hodgson.                                       | ...                                    | ...                                    | ...                                  |          |
| Assistant Conservator--  | 6   | <i>Pilot</i>  | ...                                    | ...                                    | ...                                  |          |
|  | 1   | *Mr. R. S. Pearson.                                       | Acting 4th grade Deputy Conservator.   | Mr. J. D. Maitland-Kirwan.             | 19th March 1904.                     |          |
|  | 2   | *Mr. O. S. McKenzie.                                      | Do.                                    | Vacant                                 | ...                                  |          |
|  | 3   | *Mr. G. E. Marjoribanks.                                  | ...                                    | ...                                    | ...                                  |          |
|  | 4   | *Mr. H. L. Newman.  | ...                                    | ...                                    | 7th January 1903.                    |          |
| First grade: 5 appointments on Rs. 450.  | 5   | <i>Permanently transferred to the Provincial Service.</i> | ...                                    | ...                                    | ...                                  |          |
|  | 1   | *Mr. J. D. Maitland-Kirwan.                               | Acting 1st grade Assistant Conservator | Vacant                                 | ...                                  |          |
|  | 2   | *Mr. P. E. Aitchison.                                     | ...                                    | ...                                    | ...                                  |          |
|  | 3   | Vacant  | ...                                    | ...                                    | 10th March 1904.                     |          |
|  | 4   | <i>Permanently transferred to the Provincial Service.</i> | ...                                    | ...                                    | ...                                  |          |
| Second grade: 4 appointments on Rs. 350.   | 1   | Mr. Eustamij H. Madan, L. C. E.                           | ...                                    | ...                                    | ...                                  |          |
|  | 1   | Mr. Showkham Pribda.                                      | ...                                    | ...                                    | ...                                  |          |
|  | 1   | Mr. W. A. Wallinger.                                      | ...                                    | ...                                    | ...                                  |          |
|  | 2   | Mr. Harind Mitra, L. C. E.                                | ...                                    | ...                                    | ...                                  |          |
|  | 3   | Nanabhai Dadabhai Satarawala, L. C. E.                    | ...                                    | ...                                    | ...                                  |          |
| Extra Deputy Conservators--<br>Third grade: 1 appointment on Rs. 500.<br>Fourth grade: 1 appointment on Rs. 450.<br>Extra Assistant Conservators-- | 4   | Mr. Ganesh Sakharan Hinge.                                | ...                                    | ...                                    | ...                                  |          |
|  | 5   | Mr. Arthur Charles Robinson, L. C. E.                     | ...                                    | ...                                    | ...                                  |          |
|  | 1   | Mr. W. A. Wallinger.                                      | ...                                    | ...                                    | ...                                  |          |
|  | 2   | Mr. Harind Mitra, L. C. E.                                | ...                                    | ...                                    | ...                                  |          |
|  | 3   | Nanabhai Dadabhai Satarawala, L. C. E.                    | ...                                    | ...                                    | ...                                  |          |
| First grade: 5 appointments on Rs. 350.  | 4   | Mr. Ganesh Sakharan Hinge.                                | ...                                    | ...                                    | ...                                  |          |
|  | 5   | Mr. Arthur Charles Robinson, L. C. E.                     | ...                                    | ...                                    | ...                                  |          |
|  | 1   | Mr. W. A. Wallinger.                                      | ...                                    | ...                                    | ...                                  |          |
|  | 2   | Mr. Harind Mitra, L. C. E.                                | ...                                    | ...                                    | ...                                  |          |
|  | 3   | Nanabhai Dadabhai Satarawala, L. C. E.                    | ...                                    | ...                                    | ...                                  |          |

## EXTRACTS FROM OFFICIAL GAZETTES.

JXXXV

| Appointment.                                   | No. | Holder of the Substantive Appointment.      | Cause of vacancies.                                | Holder of Acting Appointment in grade. | Date of Appointment to act in grade. | REMARKS. |
|--|-----|---|--|--|--------------------------------------|----------|
| 1  | 2   | 3   | 4  | 5                                      | 6                                    | 7        |
| Second grade:<br>5 appointments on<br>Rs. 300. | 1   | Mr. Balvant Ganesh Deshpande.               | ...  | ...                                    | ...                                  |          |
|  | 2   | Mr. V. D. P. Rebelro, L. C. E.              | ...  | ...                                    | ...                                  |          |
|  | 3   | Mr. Ardesar Nisarvanji Ma ter, L.C.E.       | ...  | ...                                    | ...                                  |          |
|  | 4   | Mr. Bhagvandas Harbhisandas Dahil, L. C. E. | Services lent to Rajppla State from 20th May 1897. | ...                                    | ...                                  |          |
|  | 5   | Mr. Dattatraya Manjunath Bijur.             | ...  | ...                                    | ...                                  |          |
| Third grade:<br>6 appointments on<br>Rs. 250.  | 1   | Mr. Chulhal Gulabchand Dalla, L.C.E.        | ...  | ...                                    | ...                                  |          |
|  | 2   | Mr. Ganpat Jayvant Rege.                    | ...  | ...                                    | ...                                  |          |
|  | 3   | Mr. Abdul Nasul Khajbaksh.                  | ...  | ...                                    | ...                                  |          |
|  | 4   | Mr. Harihar Anant Narni, L.C.E.             | ...  | ...                                    | ...                                  |          |
|  | 5   | Mr. Ganpat Ramji Mane.                      | ...  | ...                                    | ...                                  |          |
|  | 6   | Mr. Govind Ramchandars Takle                | ...  | ...                                    | ...                                  |          |
| Fourth grade:<br>5 appointments on<br>Rs. 200. | 1   | Mr. Rajbhai Jadhavbhai Patel, L.C.E.        | ...  | ...                                    | ...                                  |          |
|  | 2   | Mr. Gopal Manjunath Bhaskar.                | ...  | ...                                    | ...                                  |          |
|  | 3   | Mr. Lakshman Shamrao Koppikar.              | ...  | ...                                    | ...                                  |          |
|  | 4   | Mr. Dinkar Narayen Damle.                   | ...  | ...                                    | ...                                  |          |
|  | 5   | Mr. Krishnaji Balvant Gokhale, L.C.E.       | ...  | ...                                    | ...                                  |          |
|  | 6   | Mr. Metharam Deumal Jagtani.                | ...  | ...                                    | ...                                  |          |

## 4.—BENGAL GAZETTE.

12th September 1904.—No. 2002T.R.—Mr. R. G. A. Hannah, Extra Assistant Conservator of Forests, attached to the Sundarbans Division, is allowed leave for one month, under Article 260 of the Civil Service Regulations, from the 6th October 1904.

26th September 1904.—No. 2284T.R.—Mr. P. Tinne, Assistant Conservator of Forests, on being relieved of the charge of the Tista Division, was transferred to the Darjeeling Division as an attached officer on the 2nd May 1904.

## 5.—UNITED PROVINCES GAZETTE.

1st September 1904.—No. 3344—II—61-1904.—Mr. T. J. Campbell, Deputy Conservator of Forests, in charge of the Naini Tal Forest Division of the Central Circle, furlough combined with such privilege leave as may be due to him for a total period of two years from 30th July 1904.

1st September 1904.—No. 3345—II—61-1904.—Mr. W. H. Lovegrove, Deputy Conservator of Forests, in charge of the Garhwal Forest Division of the Central Circle, to hold charge of the Naini Tal Forest Division, of the same Circle, in addition to his own duties, as a temporary measure, *vice* Mr. T. J. Campbell, granted leave.

10th September 1904.—No. 3468—II—86A-12.—The following temporary promotions are notified for general information :—

| Entry No. | With effect from | Consequent on  | Name.                 | From   | To  |
|-----------|------------------|--|-----------------------|--|---|
| 1         | 30th July 1904   | The departure on leave of Mr. T. J. Campbell, Deputy Conservator of Forests. | Mr. W. H. Lovegrove.  | Deputy Conservator of Forests, 2nd grade.                | Officiating Deputy Conservator of Forests, 1st grade  |
|           |                  |  | Mr. J. C. Tulloch.    | Deputy Conservator of Forests, 3rd grade.                | Officiating Deputy Conservator of Forests, 2nd grade. |
|           |                  |  | Mr. F. F. R. Channer. | Officiating Deputy Conservator of Forests, 4th grade.    | Officiating Deputy Conservator of Forests, 3rd grade. |
|           |                  |  | Mr. E. A. Courthope.  | Officiating Assistant Conservator of Forests, 1st grade. | Officiating Deputy Conservator of Forests, 4th grade. |

26th September 1904.—No. 3705—II—397-1904.—Mr. T. Carr, Assistant Conservator of Forests, attached to the Garhwal Forest Division, Central Circle, examination leave for one month from 23rd September 1904, or subsequent date.

## 6.—PUNJAB GAZETTE.

12th September 1904.—No. 407—A. L. No. 13—*Erratum*.—In Notification No. 104.—A. L. No. 5 of 29th February 1904, against the name of Mr. Barrett, in the first entry under column "Present Grade," for "Provisional Deputy Conservator, 3rd Grade," read "Deputy Conservator, 4th Grade."

22nd September 1904.—No. 2154 S.—*Promotions*.—His Honour the Lieutenant-Governor is pleased to make the following promotions consequent on the deputation of Mr. Fazl-ud-din, II, Extra Assistant Conservator, 2nd grade, to the Patiala State :—

Pandit Gokal Das, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator, 2nd grade, *sub. pro tem.* with effect from the 8th July 1904.

Lala Mul Raj, Extra Assistant Conservator, 4th grade, Provincial substantive, to be Extra Assistant Conservator, 3rd grade, sub. *pro tem.*, with effect from 12th August 1904.

Lala Devi Ditta, Forest Ranger, 2nd grade, sub. *pro tem.*, to be Extra Assistant Conservator, 4th grade, sub. *pro tem.*, on probation, with effect from the 8th July 1904.

23rd September 1904.—No. 416.—*Examination.*—Lala Mul Raj, Extra Assistant Conservator of Forests, 4th grade, passed the Departmental Examination in Nagri prescribed by Section 72, Forest Department Code, on 11th August 1904.

#### 7.—CENTRAL PROVINCES GAZETTE.

25th August 1904.—No. 55.—The leave on medical certificate for six months, under Article 340 of the Civil Service Regulations, granted to Deputy Ranger Ashik Ali, Permanent Establishment, Basim Division, by Departmental Order No. 12, dated the 5th May 1904, with effect from the 5th March 1904, is extended by three months.

30th August 1904.—No. 5336.—Consequent on the retirement of Mr. J. C. McDonell and the rise of Pilot appointment No. 1 into the 4th grade of Deputy Conservators, Rai Bahadur Mansukh Rai, Extra Assistant Conservator of Forests, 1st grade, is promoted to Extra Deputy Conservator of Forests, 4th grade, with effect from the 14th March 1904.

31st August 1904.—No. 5363.—Mr. James Donald, Assistant Conservator of Forests, attached to the Balaghat Forest Division, has been transferred to Nagpur, and attached to the Direction Division, Southern Circle, Central Provinces, with effect from the 20th August 1904.

4th September 1904.—No. 58.—Privilege leave on full pay for one month, under Article 260 of the Civil Service Regulations, granted to 1st grade Forest Ranger Narsingha Rao, Ellichpur Division, with effect from the 26th July 1904, is extended by twenty-seven days.

14th September 1904.—No. 5693.—Privilege leave for one day, under Articles 246 and 260 of the Civil Service Regulations, is granted to Mr. G. F. Taylor, Deputy Conservator of Forests, 1st grade, in extension of the privilege leave granted him by Order No. 4477, dated the 26th July 1904.

18th September 1904.—No. 66.—Privilege leave on full pay for one month, under Article 260 of the Civil Service Regulations, is granted to Officiating 2nd grade Deputy Ranger Thamman Singh, Permanent Establishment, Wun Division, with effect from the 27th September 1904, or such subsequent date as he may be permitted to avail himself of it.

18th September 1904.—No. 67.—The furlough on half pay for seven months and eight days granted to Deputy Ranger Ahmad Saheb in Departmental Order No. 1, dated the 2nd April 1904, is extended up to the 21st January 1905 inclusive.

20th September 1904.—No. 5845.—Under Section 67 of the Indian Forest Act (VII of 1878), the Officiating Chief Commissioner is pleased to invest Forest Ranger Chintaman Vishwanath Sarwate with the powers described in that section.

21st September 1904.—No. 5856.—Mr. B. Inamati Shamarao, Extra Assistant Conservator of Forests, attached to the Seoni Forest Division, on relieving Mr. N. C. McLeod, Extra Assistant Conservator of Forests, has been appointed to hold charge of that Division with effect from the afternoon of the 20th August 1904.

#### 8.—BURMA GAZETTE.

16th August 1904.—No. 376.—On his return from foreign service Mr. W. F. L. Tottenham, Deputy Conservator of Forests, is posted to the charge of the Myitkyina Forest Division.



28th August 1904.—No. 385.—In item No. (2) of Revenue Department Notification No. 362 (Forests), dated the 8th August 1904, for “with effect from the 31st March 1904” read “with effect from the 1st April 1904.”

29th August 1904.—No. 381.—Under the provisions of Articles 233, 246, 260 and 338 of the Civil Service Regulations, Mr. W. A. Hearsey, Extra Deputy Conservator of Forests, is granted privilege leave for three months and furlough in continuation thereof for one year with effect from the 16th September 1904, or the subsequent date on which he may avail himself of the privilege leave.

29th August 1904.—No. 382.—Mr. J. J. Rorie, Officiating Deputy Conservator of Forests, is transferred from Rangoon, and is posted to the charge of the Shwegyin Forest Division, *vice* Mr. W. A. Hearsey, Extra Deputy Conservator of Forests, proceeding on leave.

30th August 1904.—No. 24.—Mr. H. L. P. Walsh, Deputy Conservator of Forests, made over, and Mr. T. W. Forster, Extra Assistant Conservator of Forests, received, charge of the Pyinmana Forest Division on the afternoon of the 24th August 1904.

4th September 1904.—No. 398.—Mr. T. W. Forster, Extra Assistant Conservator of Forests, 2nd grade, is posted to the charge of the Pyinmana Forest Division, as a temporary measure, *vice* Mr. H. L. P. Walsh, Officiating Deputy Conservator of Forests, transferred.

4th September 1904.—No. 399.—On relief by Mr. T. W. Forster. Extra Assistant Conservator of Forests, Mr. H. L. P. Walsh, Officiating Deputy Conservator of Forests, is transferred from Pyinmana and is posted to working-plans duty in the Ruby Mines Forest Division.

9th September 1904.—No. 400.—Under the provisions of Articles 233, 260 and 308 (b) of the Civil Service Regulations, Mr. A. E. Ross, Deputy Conservator of Forests, is granted privilege leave for three months and furlough in continuation thereof for one year and six months with effect from the 28th August 1904.

Revenue Department Notification No. 348 (Forests), dated the 3rd August 1904, is hereby cancelled.

9th September 1904.—No. 395.—Mr. J. L. Hefferman, Extra Assistant Conservator of Forests, is transferred from the Shwegu Forest Sub-division to the charge of the South Tharrawaddy Forest Sub-division.

9th September 1904.—No. 396.—On relief by Mr. J. L. Hefferman, Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, is transferred from the South Tharrawaddy Forest Sub-division to the charge of the Shwegu Forest Sub-division.

10th September 1904.—No. 401.—On return from leave, Mr. R. E. Marsden, Assistant Conservator of Forests, is temporarily posted to Pakokku in the Yaw Forest Division for timber measurements.

10th September 1904.—No. 11.—With reference to Revenue Department Notification No. 378 (Forests), dated the 16th August 1904, Messrs. J. Messer and W. F. L. Tottenham, Deputy Conservators of Forests, respectively, made over and received charge of the Myitkyina Division on the forenoon of the 7th September 1904.

13th September 1904.—No. 12.—Maung Kan Gyi, Ranger, 1st grade, was granted privilege leave for two months, which he availed himself of with effect from 1st September 1904.

13th September 1904. No. 405.—The following alteration of rank is ordered in the Forest Department :—

With effect from the 6th June 1904, Mr. G. R. Jeffery, Assistant Conservator, 2nd grade, *prov. sub.*, to officiate as Deputy Conservator, 4th grade.

No 406.—The following alterations in rank are ordered in the Forest Department in supersession of those ordered in this Department Notification No. 192, dated the 6th May 1904 :—

- (1) With effect from the 2nd February 1904, consequent on the deputation of Mr. M. Hill,\* Deputy Conservator of Forests, 2nd grade:—  
 Mr. F. J. Branthwaite, Deputy Conservator, 3rd grade, to be Deputy Conservator, 2nd grade, *prov. sub.*  
 Mr. C. W. A. Bruce, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.  
 Mr. R. S. Troup, Deputy Conservator, 4th grade, *prov. sub.*, to officiate as Deputy Conservator, 3rd grade.  
 Mr. R. E. Marsden, Assistant Conservator, 1st grade, *prov. sub.*, to officiate as Deputy Conservator, 4th grade.
- (2) With effect from the 9th February 1904, consequent on the return from leave of Mr. G. K. Parker, Deputy Conservator, 4th grade, *prov. sub.*—  
 Mr. G. K. Parker, Deputy Conservator, 4th grade, *prov. sub.*, to officiate as Deputy Conservator, 3rd grade.  
 Mr. R. S. Troup, Deputy Conservator, 4th grade, *prov. sub.*, (officiating Deputy Conservator, 3rd grade), to revert to his *prov. sub.* appointment.  
 Mr. R. E. Marsden, Assistant Conservator, 1st grade, *prov. sub.* (officiating Deputy Conservator, 4th grade), to revert to his *prov. sub.* appointment.

This Department Notification No. 192 (Forests), dated the 6th May 1904, is hereby cancelled.

13th September 1904 — No. 407 (*Forests*) (*Corrigendum*) — The revisions ordered in this Department Notification No. 238 (*Forests*), dated the 27th May 1904, will take effect from 4th March 1904, and not from 1st March 1904.

16th September 1904 — No. 410 — On return from leave, Mr. L. C. Davis, Assistant Conservator of Forests, is temporarily posted to Pakokku in the Yaw Forest Division for timber measurements

## 9.—ASSAM GAZETTE.

27th August 1904.—No. 7606G.—The following notification by the Government of India in the Department of Revenue and Agriculture is republished:—

Notification No. 961F. (*Forests*), dated Simla, the 18th August 1904.

1st September 1904 — No. 7754G.—The following notification by the Government of India in the Department of Revenue and Agriculture is republished:—

Notification No. 978F.—258-1 (*Forests*), dated Simla, the 22nd August 1904.

8th September 1904.—No. 7907G.—With effect from the 9th July 1904, the date of retirement of Mr. F. S. Barker, Assistant Conservator of Forests, 1st grade, the Assistant Conservatorship of the 2nd grade, transferred to the Provincial Service by Notification No. 8135G., dated the 14th September 1900, will rise to the 1st grade; and the following promotions are ordered from the same date (9th July 1904), consequent on the resulting addition of a corresponding appointment to the Provincial Service:—

Rai Sahib Upendra Nath Kanjilal, Extra Assistant Conservator of Forests, 2nd grade, *seconded* to be Extra Assistant Conservator of Forests, 1st grade, and to continue *seconded*.

Babu Kripa Nath De, Extra Assistant Conservator of Forests, 3rd grade (*provisionally substantive* 2nd grade), to be Extra Assistant Conservator of Forests, 1st grade, *provisionally substantive*.

15th September 1904.—No. 8098G.—Mr. G. M. Townshend, Assistant Conservator of Forests, on return from leave, is attached to the Kamrup Forest Division.

16th September 1904.—No. 8145G.—The following is published:—

The undermentioned officers have been granted by His Majesty's Secretary of State for India extension of leave or permission to return to duty, as advised in List, dated the 19th August 1904:—

| Name.                 | Service. | Appointment.                            | Period and nature of extension. |
|-----------------------|----------|---|---------------------------------|
| Mr. G M. Townshend .. | ..       | Assistant Conservator of Forests, Assam | ..                              |

10.—MYSORE GAZETTE.

26th August 1904—No. R. 1694-20-5—1694-05.—Mr. M. Srinivasa Rao, Sub-Assistant Conservator of Forests, having been relieved by Mr. S. A. Bapu Rao, Deputy Conservator of Forests at Kolar, on the 6th August 1904, is posted to the Mysore District for duty under the District Forest Officer until further orders.

## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—GAZETTE OF INDIA.

5th October 1904.—No. 1138—154-16-F.—The services of Mr. S. A. Wood, Extra Assistant Conservator of Forests, 2nd grade, Burma, are placed at the disposal of the Sudan Government for a period of three years.

5th October 1904.—No. 4105.—Under the provisions of articles 246 and 260 of the Civil Service Regulations and 68A of the Forest Department Code, the Hon'ble the Agent to the Governor-General and Chief is pleased to grant Bhai Sadhu Singh, Extra Assistant Conservator of Forests, in Baluchistan, privilege leave for 42 days, with effect from the 20th October 1904, or such subsequent date as he may avail himself of it.

### 2.—MADRAS GAZETTE.

7th September 1904.—Leave.—Mr. G. W. Thompson, Ranger, 1st grade, Vizagapatam district, is granted privilege leave for three months from 4th August 1904.

7th September 1904.—Leave.—Mr. M. S. Noronha, Ranger, II, North Coimbatore, is granted privilege leave for six weeks with effect from 20th September 1904.

20th September 1904.—Postings.—The following postings, etc., are ordered:—

(2) On return of Ranger Mr. Thompson from leave, Ranger Seenayya is posted to the Bellary district, *vice* Thumbu Naidu, granted three months' privilege leave from date of relief.

(3) On return from leave Ranger Anantha Row is re-gazetted to the Bellary district to relieve Mr. McLaughlin.

23rd September 1904.—Leave.—S. Thumbu Naidu, Ranger, 6th grade, acting sub. *pro tem.*, Bellary district, is granted privilege leave for three months from date of relief by Ranger Seenayya.

14th October 1904.—No. 367.—Mr. Charles Edward Brasier, Conservator of Forests, is granted an extension of privilege leave by one day.

21st October 1904.—No. 373.—The following appointments are made:—

(1) Mr. Henry Joshua McLaughlin, to be Extra Assistant Conservator of Forests, 3rd grade, to fill an existing vacancy.

(2) Mr. Nicholas Manuel Rego, to be Extra Assistant Conservator of Forests, 3rd grade, to fill an existing vacancy.

(3) Saiyid Burhanuddin Sahib Bahadur, to be Extra Assistant Conservator of Forests, 3rd grade, to fill an existing vacancy.

(4) Mr. E. C. M. Mascarenhas, to be Extra Assistant Conservator of Forests, 3rd grade, to fill an existing vacancy.

(5) Mr. J. A. Daly, to be Extra Assistant Conservator of Forests, 3rd grade, to fill the appointment created in the grade on the reconstitution of the Godavari, Kistna and Nellore districts.

(6) Mr. A. G. VanHaeften, Forest Ranger, 1st grade, to be Extra Assistant Conservator of Forests, 4th grade, on probation for one year.

(7) Mr. R. Ry P. Ananda Rao, Forest Ranger, 1st grade, to be Extra Assistant Conservator of Forests, 4th grade, on probation for one year.

(8) Mr. G. W. Thompson, Forest Ranger, 1st grade, to be Extra Assistant Conservator of Forests, 4th grade, on probation for one year.

Note.—Appointment No. (8) will be temporary to compensate for an existing vacancy in the 2nd grade.

**3.—BOMBAY GAZETTE.**

*5th October 1904.*—No. 1934.—Mr. W. F. D. Fisher, Deputy Conservator of Forests, 3rd grade, delivered over and Mr. R. H. Madan, Extra Deputy Conservator of Forests, 3rd grade, received charge of the office of the Divisional Forest Officer, North Thana, on the 3rd October 1904, in the forenoon.

*5th October 1904.*—No. 1935.—In exercise of the powers delegated to him under Government Resolution No. 2189, dated 20th March 1889, the Conservator of Forest, N. C., has granted one month's privilege leave with effect from the 3rd instant to Mr. W. F. D. Fisher, Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, North Thana.

*19th October 1904.*—No. 8045.—Mr. G. R. Duxbury, Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, Working Plans N. C., is allowed such privilege leave as may be due to him on 29th October 1904 in combination with furlough for such period as may bring the combined period of absence up to one year.

*19th October 1904.*—No. 8046.—His Excellency the Governor in Council is pleased to make the following appointments:—

Mr. W. A. Talbot, on return to duty, to be Conservator of Forests, Southern Circle.

Mr. H. Murray, on relief, to be Divisional Forest Officer, Nasik.

Mr. Dinkar Narayen Damle to hold charge of the office of Divisional Forest Officer, Nasik, from date of departure of Mr. A. G. Edie, pending relief by Mr. H. Murray.

*19th October 1904.*—No. 8048.—Mr. P. E. Aitchison, Assistant Conservator of Forests, S. D. Kanara, passed an examination in Kanarese according to the Lower Standard on 17th September 1904.

Messrs. K. B. Gokhale, L. C. E., Sub-Divisional Forest Officer, S. D. Kanara, and Metharam Deumal Jagtiani, Sub-Divisional Forest Officer, Central Thana, passed on 18th September 1904 an examination in subjects prescribed in No. VI of the rules published in Government Notification No. 2, dated 3rd January 1894, for the examination of officers of the Forest Department.

*31st October 1904.*—No. 8380.—Mr. R. H. Madan, Divisional Forest Officer, South Thana, has been appointed to hold charge of the office of Divisional Forest Officer, North Thana, in addition to his own duties, during the absence of Mr. W. F. D. Fisher on privilege leave for one month, or pending further orders.

**4.—BENGAL GAZETTE.**

*28th September 1904.*—No. 2371 T. R.—Mr. P. J. Draper, Extra Assistant Conservator of Forests, was attached to the Sonthal Parganas Division from 20th to 22nd July 1904.

*17th October 1904.*—No. 2778 T. R.—Mr. J. P. Haslett, Extra Assistant Conservator of Forests, Palamau Forest Division, is also placed in charge of the Reserved and Protected Forests in the district of Hazaribagh, with effect from the forenoon of the 26th September 1904.

*28th October 1904.*—No. 2959 T. R.—Mr. R. G. A. Hannah, Extra Assistant Conservator of Forests, availed himself of the one month's privilege leave granted to him in Notification No. 2002 T. R., dated the 12th September 1904, with effect from the 3rd October 1904.

**5.—UNITED PROVINCES GAZETTE.—Nil.****6.—PUNJAB GAZETTE.**

*4th October 1904.*—No. 441.—Lala Jwala Prasad, Extra Assistant Conservator of Forests, and Mr. C. F. Rossiter, Extra Deputy Conservator of Forests, respectively, made over and received charge of the Multan Forest Division on the forenoon of the 3rd September 1904, consequent on the latter's return from privilege leave.

On and from the said date Lala Jwala Prasad will hold charge of the Montgomery Division only.

4th October 1904.—No. 444.—Consequent on the departure on 59 days' privilege leave of Mr. Rossiter, Extra Deputy Conservator, 4th grade, the following promotion takes place:—

Munshi Fazl-ud-din (I), Khan Bahadur, Extra Assistant Conservator of Forests, 1st grade, to officiate as Extra Deputy Conservator, 4th grade, with effect from 6th July 1904.

19th October 1904.—No. 459.—Lala Devi Ditta, Extra Assistant Conservator of Forests, was relieved of his duties in the Rawalpindi Division, on the afternoon of the 21st September 1904, on transfer to the Hazara Division, to which he has been attached with effect from the forenoon of the 23rd idem.

19th October 1904.—No. 463.—Lala Mulraj, Extra Assistant Conservator of Forests, was relieved of his duties in the Bashahr Division, on the forenoon of the 16th September 1904, on transfer to the Rawalpindi Division, of which he took over charge on the afternoon of the 24th idem, relieving Mr. W. Shakespear, Deputy Conservator of Forests, who retired from service from the same date.

#### 7.—CENTRAL PROVINCES GAZETTE.

21st September 1904.—No. 69.—Privilege leave on full pay for five days, under Article 260 of the Civil Service Regulations, was granted to 1st grade Deputy Ranger Bhonaji Sonaji, Permanent Establishment, Buldana Division, with effect from the 16th August 1904.

11th October 1904.—No. 6312.—Mr. A. Hunt, Extra Assistant Conservator of Forests, attached to the Balaghat Division, is transferred to the charge of the Betul Division.

On relief by Mr. A. Hunt, Mr. Ganga Parshad Khatri is attached to the Balaghat Division.

21st October 1904.—No. 6615.—Consequent on the deputation on Foreign Service of Mr. N. C. McLeod, Extra Assistant Conservator of Forests, 1st grade, the following promotions are ordered with effect from the 21st August 1904:—

- (1) Mr. S. Srinivasalu Naidu, Extra Assistant Conservator of Forests, 2nd grade, to be Extra Assistant Conservator of Forests, 1st grade, sub. *pro tem*.
- (2) Mr. S. K. Parsons, Extra Assistant Conservator of Forest, 3rd grade, to be Extra Assistant Conservator of Forests, 2nd grade, sub. *pro tem*.
- (3) Mr. B. Inamati Sham Rao, Extra Assistant Conservator of Forests, 4th grade, to be Extra Assistant Conservator of Forests, 3rd grade, sub. *pro tem*.
- (4) Mr. Dhanji Shah N. Avasia, Ranger, 1st grade, to be Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem*.

#### 8.—BURMA GAZETTE.

16th September 1904.—No. 415.—The following alteration of rank in the Forest Department is ordered with effect from 1st April 1904:—

Mr. F. C. Purkis, Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem*, to be confirmed in his appointment.

16th September 1904.—No. 416.—On return from leave, Mr. W. H. Craddock, Extra Assistant Conservator of Forests, is posted to the headquarters of the Tenasserim Circle as Personal Assistant to the Conservator of Forests.

19th September 1904.—No. 36.—With reference to Revenue Department Notification No. 400 (Forests), dated the 9th September 1904, Mr. A. E. Ross, Deputy Conservator of Forests, availed himself of the leave on the afternoon of the 27th August 1904.

19th September 1904.—No. 37.—With reference to the Revenue Department Notification No. 323 (Forests), dated the 11th July 1904, Mr. A. S. Rencontre, Extra Assistant Conservator of Forests, reported his return to duty on the forenoon of the 9th August 1904.

23rd September 1904.—No. 23.—With reference to Revenue Department Notification No. 382 (Forests), dated the 29th August 1904, Mr. J. J. Rorie, Officiating Deputy Conservator of Forests, handed over charge of his duties as Working Plans Officer in the Pegu Circle, on the afternoon of the 8th September 1904.

23rd September 1904.—No. 25.—Mr. S. A. Wood, Extra Assistant Conservator of Forests, deputed for service under the Sudan Government, was relieved of the charge of the Bampôn Forest Sub-Division, Southern Shan States Division, on the afternoon of the 13th September 1904.

23rd September 1904.—No. 423.—On his return from leave, Mr. R. R. O'Hara, Extra Assistant Conservator of Forests, is posted to the charge of the North Tharrawaddy Forest Sub-Division.

23rd September 1904.—No. 424.—On relief by Mr. R. R. O'Hara Maung Tha Ka Do, Extra Assistant Conservator of Forests, is transferred from the North Tharrawaddy Forest Sub-Division to the charge of the Paungde Forest Sub-Division.

24th September 1904.—No. 38.—Mr. D. A. Allan, Forest Ranger, is granted three months' privilege leave, with effect from the 7th September 1904.

25th September 1904.—No. 426.—Mr. G. K. Parker, Deputy Conservator of Forests, is transferred from the Thaungyin Forest Division and posted to the charge of the Ataran Forest Division, *vice* Mr. A. Weston, retired.

26th September 1904.—No. 26.—With reference to Revenue Department Notification No. 399 (Forests), dated the 7th September 1904, Mr. H. L. P. Walsh, Officiating Deputy Conservator of Forests, assumed charge of his duties as Working Plans Officer, Ruby Mines Forest Division, on the forenoon of the 25th August 1904.

28th September 1904.—No. 40.—With reference to Revenue Department Notification No. 416 (Forests), dated the 16th September 1904, Mr. W. H. Craddock, Extra Assistant Conservator of Forests, assumed charge of his duties as Personal Assistant to the Conservator of Forests, Tenasserim Circle, on the forenoon of the 22nd September 1904.

29th September 1904.—No. 41.—With reference to Revenue Department Notification No. 382 (Forests), dated the 29th August 1904, Mr. J. J. Rorie, Officiating Deputy Conservator of Forests, assumed charge of the Shwegyin Division, relieving Mr. W. A. Hearsey, Extra Deputy Conservator of Forests, on the forenoon of the 19th September 1904.

29th September 1904.—No. 42.—With reference to Revenue Department Notification No. 381 (Forests), dated 29th August 1904, Mr. W. A. Hearsey, Extra Deputy Conservator of Forests, availed himself of the leave on the forenoon of the 19th September 1904.

29th September 1904.—No. 13.—With reference to Revenue Department Notification No. 395 (Forests), dated the 8th September 1904, Mr. J. L. Hefferman, Extra Assistant Conservator of Forests, made over, and Mr. G. F. R. Blackwell, Deputy Conservator of Forests, received charge of the Shwegu Sub-Division on the afternoon of the 23rd September 1904.

29th September 1904.—No. 432.—On relief by Mr. W. H. Craddock, Mr. H. C. Walker, Officiating Deputy Conservator of Forests, is transferred from Rangoon and posted to the Working Plans duty in the Thayemyo Forest Division.

29th September 1904.—No. 614.—The following alterations in rank are ordered in the Subordinate Forest Service:—

(1) With effect from the 1st April 1904—

Mr. D. A. Allen, Ranger, 2nd grade, to be Ranger, 1st grade.

Mr. C. H. Hearsey, Ranger, 2nd grade, *prov. sub.*, to be confirmed in his appointment.

Mr. C. C. Chill, Ranger, 2nd grade, *prov. sub.*, to be confirmed in his appointment.

Maung Tun Tha, Ranger, 3rd grade, to be Ranger, 2nd grade.

Maung Aung Thu, Ranger, 3rd grade, *sub. pro tem.*, to be confirmed in his appointment.

Maung Pan U, Ranger, 3rd grade, *sub. pro tem.*, to be confirmed in his appointment.

Maung Tun, Ranger, 3rd grade, *sub. pro tem.*, to be confirmed in his appointment.

Maung Nyo Dun, Ranger, 3rd grade, *sub. pro tem.*, to be confirmed in his appointment.

Mr. F. Dalton, Ranger, 4th grade, to be Ranger, 3rd grade, *sub. pro tem.*

(2) With effect from the 12th May 1904—

Mr. A. R. Brown, Ranger, 3rd grade, to be Ranger, 2nd grade, *sub. pro tem.*

Mr. E. W. Dalton, Ranger, 5th grade, to be Ranger, 3rd grade, *sub. pro tem.*

3rd October 1904.—No. 43.—With reference to Revenue Department Notification No. 426 (Forests), dated the 25th September 1904, Mr. G. K. Parker, Deputy Conservator of Forests, assumed charge of the Ataran Division, relieving Mr. A. Weston, Deputy Conservator of Forests, on the afternoon of the 17th September 1904.

3rd October 1904.—No. 24.—Mr. L. Swarries, Forest Ranger, 1st grade, made over charge of the Rangoon Government Timber Depot, Depot and Agency Division, to Mr. J. D. Hamilton, Forest Ranger, 2nd grade, on the forenoon of the 1st September 1904, and availed himself on the forenoon of the 27th September 1904, of the three months' privilege leave combined with one year and nine months' furlough granted to him.

6th October 1904.—No. 27.—With reference to Revenue Department Notification No. 401 (Forests), dated 10th September 1904, Mr. R. E. Marsden, Assistant Conservator of Forests, assumed charge of his duties in the Yaw Division, on the afternoon of the 17th September 1904.

6th October 1904.—No. 28.—With reference to Revenue Department Notification No. 410 (Forests), dated 16th September 1904, Mr. L. C. Davis, Assistant Conservator of Forests, assumed charge of his duties in the Yaw Division, on the afternoon of the 28th September 1904.

7th October 1904.—No. 25.—With reference to Revenue Department Notification No. 396 (Forests), dated 8th September 1904, Mr. L. Hefferman, Extra Assistant Conservator of Forests, assumed charge of the duties of the South Tharrawaddy Sub-Division, Tharrawaddy Division, on the afternoon of 1st October 1904, relieving Mr. P. E. Plunkett, Extra Assistant Conservator of Forests.

10th October 1904.—No. 450.—The following alteration in rank is ordered in the Forests Department :—

With effect from the 28th August 1904, consequent on the departure on leave of Mr. A. E. Ross, Officiating Deputy Conservator, 3rd grade.

Mr. H. W. A. Watson, Deputy Conservator, 4th grade, *prov. sub.*, to officiate as Deputy Conservator, 3rd grade.

12th October 1904.—No. 447.—Under the provisions of Articles 246 and 260 of the Civil Service Regulations, Mr. W. J. G. Cooper, Extra Assistant Conservator of Forests, is granted privilege leave for one month and twenty days, with effect from the date on which he may avail himself of the leave.

12th October 1904.—No. 448.—On return from leave, Mr. E. B. Powell, Extra Assistant Conservator of Forests, is posted to Kyaikto for duty in the Thauingyin Forest Division.

12th October 1904.—No. 449.—On relief by Mr. W. H. Craddock, Mr. H. C. Walker, Officiating Deputy Conservator of Forests, is transferred from



Rangoon and is posted to Working Plans duty in the Thaungyin Forest Division.

This Department Notification No. 432 (Forests), dated the 1st October 1904, is cancelled.

13th October 1904.—No. 451.—On return from leave, Mr. F. J. Branthwaite, Deputy Conservator of Forests, is posted to the charge of the Thayetmyo Forest Division, *vice* Mr. A. Rodger, Officiating Deputy Conservator of Forests, transferred.

13th October 1904.—No. 452.—On relief by Mr. Branthwaite, Mr. A. Rodger, Officiating Deputy Conservator of Forests, Thayetmyo Division, is posted to Working Plans duty, in the Thayetmyo Forest Division.

16th October 1904.—No. 455.—Mr. F. J. Branthwaite, Deputy Conservator of Forests, is permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

16th October 1904.—No. 456.—Mr. F. H. Todd, Deputy Conservator of Forests, is permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

18th October 1904.—No. 14.—With reference to Revenue Department Notification No. 396 (Forests), dated the 8th September 1904, Mr. G. F. R. Blackwell, Deputy Conservator of Forests, made over, and Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, received charge of the Shwegu Sub-Division, on the forenoon of the 13th October 1904.

19th October 1904.—No. 466.—Mr. R. E. Marsden, Assistant Conservator of Forests, is transferred from the Yaw Forest Division and is posted to Working Plans duty in the Myittha Forest Division.

19th October 1904.—No. 467.—Mr. L. C. Davis, Assistant Conservator of Forests, is transferred from the Yaw Forest Division, and is posted to Working Plans duty in the Upper Chindwin Division.

9.—ASSAM GAZETTE.—*Nil*

10.—MYSORE GAZETTE.—*Nil*.

# VIEWS

OF

**DR. E. J. BUTLER, M.B., F.L.S.,**

CRYPTOGAMIC BOTANIST TO THE GOVERNMENT OF INDIA,

ON THE

REPORT BY MR. M. MUTHANNAH, RAI BAHADUR, CONSERVATOR  
FORESTS, MYSORE,

ON

**"SPIKE" DISEASE IN SANDALWOOD.**



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VIEWS  
OF  
DR. E. J. BUTLER, M.B., F.L.S.,  
CRYPTOGAMIC BOTANIST TO THE GOVERNMENT OF INDIA,  
ON THE  
Report by Mr. M. Muthannah, Rai Bahadur Conservator of Forests, Mysore.  
ON  
“SPIKE” DISEASE IN SANDALWOOD.

*Dated the 3rd June 1904.*

— Rai Bahadur M. Muthannah endeavours to prove with regard to the condition known as “spike” that it is not a disease but is merely an unhealthy condition of the tree due to—

- a.* Deficient shade (paragraph 1, Report of the 14th June 1903).
- b.* Excessive shade combined with dampness and drip (paragraphs 25 and 28).
- c.* Injury, such as fire (paragraphs 16 and 23), overgrowth by climbing shrubs (paragraphs 17, 19 and 25).
- d.* Lantana growing in association with sandal (paragraphs 6, 22 and 23).
- e.* Poor or unsuitable soils (paragraphs 12, 16 and 17).
- f.* It is also added that old age, fungoid, parasitic or epiphytic growth, and water-logging conduce to the disease, but no evidence is given with regard to these.

It is, however, clear from the report, and was evident to me when on tour with Mr. Muthannah, that he has not distinguished between the definite and very peculiar condition which has now come to be known as "spike" and the stag-headed appearance due to pollarding or poor root-development and the many other evidences of want of health which sandal shares with other trees growing under unsuitable conditions. No doubt each or all of the reasons adduced by Mr. Muthannah will give rise to unmistakable signs of ill-health. I have seen numbers of unhealthy trees at Saklaspur and on the Saklaspur-Aldoor-Balehonnur-Koppa roads which I travelled over last year when visiting the coffee districts of Mysore, but not one "spiked," and indeed up to that time no "spike" had been found in that part of the State at all. "Spike" can, however, be at once distinguished from these except perhaps in its very earliest stage. So peculiar is the malformation which it causes that, as Mr. Barber has said in his Report (paragraph 11), a student confronted for the first time with a diseased tree would at once pronounce it a distinct species. Trees diseased from the conditions mentioned by Mr. Muthannah are, however, always recognisable with ease as being identical with the healthy ones. This mistake impairs seriously whatever value Mr. Muthannah's report would otherwise have. As, however, I had an opportunity of travelling over much of the ground covered by Mr. Muthannah when preparing his report, I can deal with each of the causes proposed by him *seriatim*.

- a. The disease is not always found in shaded areas. The shaded portion of the Yelwal Residency Plantation was already much diseased when I was there, though there was evidence to show that it took the disease later than the unshaded portion. The sandal area north of the Hunsur-Periyapatna road for some miles from Hunsur is well shaded but much diseased. The Fraserpet Bungalow Plantation is well shaded but the sandal there is practically exterminated by "spike." I could quote a number of other instances to establish this.

- b. Excessive shade is not a cause, for sandal is often found outside the diseased area altogether, growing under dense shade and quite healthy.
- c. Injury such as fire is at most a predisposing cause. There is no evidence of recent fire in the Yelwal Residency Plantation where certainly 95 per cent. of the trees are "spiked." It is quite common to see diseased isolated trees or clumps in hedges which show no signs of recent fire. And fires are as common outside the diseased area as within.
- d. Lantana is not a cause, for the disease has extended into the Madras sandal districts at Kollegal, Hassanur, Byalur, etc., where there is little or no Lantana (*vide* office note No. 504 of 1904, dated Coimbatore, 30th October 1903, from P. M. Lushington, Esq., District Forest Officer, North Coimbatore, to the Conservator of Forests, Southern Circle, Madras). I collected information when in Mysore of several cases of "spike" at a considerable distance from the nearest Lantana.
- e. Poor or unsuitable soil is at most a predisposing cause; for the "spiked" area between Hunsur and Periyapatna shows in parts a very fine growth of forest, and the sandal, which is now much diseased, consisted of good well-grown trees. I find in my local notes that this area was considered one of the richest in the State previous to the disease. Besides, as so often pointed out, there are great areas still quite free from the disease where, judging from what I saw on my tour, the soil is distinctly poor. On poor soil sandal does not seem to flourish but it does not necessarily show "spike" disease.
- f. Age has little influence, for I found on my last tour many diseased saplings. Mr. Lushington has found many trees under 10 years "spiked." Mr. McCarthy has found the same in Coorg. The statement that "young trees do not usually suffer" made in my Report (paragraph 10) has

now been shown to be incorrect. No fungus or other parasite has as yet been found associated with the disease. Water-logging is out of the question over the greater part of the diseased area.

Mr. Muthannah has himself recorded in his note, cases telling against almost all the causes suggested by him. Thus paragraph 8 controverts the view that spike results from want of shade; paragraphs 18 and 24, that unsuitable soil or fire can by their sole action produce it, for the diseased trees grew in immediate proximity to healthy ones; paragraph 1, that it is due to old age, etc. Finally, if Mr. Muthannah does not consider that we are face to face with a definite disease, why does he express his intention (paragraph 33) of adopting energetic measures to eradicate all trees showing signs of "spiked" leaves. If the disease be non-communicable no possible ill-effects can be anticipated from allowing them to die naturally and the advantage of whatever increase in the heartwood results will be obtained, while the expense of the extra operations required will be avoided.

The truth is that I suspect Mr. Muthannah was himself gradually coming to the conclusion that this was, in fact, a serious disease when he wrote his report, and I think he became confirmed in that belief during his tour with Mr. Barber, Dr. Lehmann and myself in September last.

I have myself no doubt that the disease is specific and communicable. The topographical observations made by us last September in the diseased area very strongly confirmed me in this opinion. How it has entered Madras I do not profess to understand, but it is at least a significant coincidence that it should have crossed the border from Kollegal to Hassanur in the direct line of the extension of the disease from the Hunsur-Fraserpet infected area south-east through Chamrajnagar towards the Madras frontier. I obtained quite reliable information last year of this extension and within a month heard that the disease was at Kollegal and was of recent appearance. We do not know how long it has existed in Mysore and there may have been ample time even for a

slowly progressing disease to have travelled this distance. Two of the sugar-cane diseases of Java, "Sereh" and "Red smut," whose progress was closely followed, travelled in just such a slow and definite manner.

The area affected is as continuous as is usually found in infectious disease. Mr. Muthannah and Mr. Lushington have both considered that the discovery of isolated diseased patches separated by some miles from the nearest disease were sufficient to dispose of the idea that the disease is communicable or at least to render it improbable. But I submit that almost every known case of infectious disease, whether in animals or plants, exhibits the same peculiarity of skipping over some places to attack others. Anthrax is often epidemic in Dehra Dun but the cases may occur a couple of miles or more from each other. Plague has passed over many localities without infecting them, and so with most other instances. Until we know the cause of the disease we must admit the likelihood of "spike" behaving in a similar manner. Leaving out this local avoidance of certain places (which are monthly becoming fewer) the disease occupies a definite area extending to the south of a line drawn from Fraserpet a short distance to the north of the Fraserpet-Mysore road, then by Chamrajnagar to the Madras border at Kollegal. North of this line the disease had not extended up to last September.

The Progress Report of Forest Administration in Coorg for 1902-03 recently to hand, shows that the recommendations given in paragraph 10 of my Report are capable of successful application. Mr. McCarthy writes (page 7, paragraph 19) that "these figures" (*i.e.*, of diseased trees removed) "would seem to show that the immediate eradication of infected trees has little influence on the spread of the disease, but on the other hand I have the satisfaction of stating that although the past operations have not tended to check the number of fresh infections in the already affected tract in which, it should be remembered, sandal is so numerous as to constitute the predominating species, there is no doubt that they have resulted in distinctly confining the area of infection to its former limits.



"Two years ago "spike" had reached to within two miles of the Kargode plantation. The Chief Commissioner is aware that stretching northwards from Kargode to the district boundary, there is still a valuable sandal tract as yet untouched by disease which includes the Kargode, Gangwara and Katteputra plantations. Particular care has been taken in immediately removing traces of "spike" along the limit of the disease near Kargode and the one satisfactory feature of this case is that undoubtedly the measures which have been taken have resulted in stopping the disease short of Kargode and the sandal tract beyond it."

Until the results of the experiments commenced last year by me to determine the nature of the infection shall be known, I consider this to be the only rational treatment.



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